Subterranea

The Magazine for Subterranea Britannica

Subterranea Britannica **December 2021 Issue 58**

IN THIS ISSUE

Underground Windsor
Guildford Caves
Sywell Weekend
OFD Cave Rescue

Subterranea Britannica is a society devoted to the study of man-made and man-used underground structures and the archaeology of the Cold War. The society is open to all and its membership includes all walks of life.
Members are invited to contribute to this magazine even if this just means sending very welcome snippets from newspapers and magazines.
Contributors to *Subterranea* also give their permission for articles and images to be reproduced on Sub Brit's website.

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Front cover photo: *One of the fascinating sites that features in Martin Dixon's article on Underground Windsor in this edition. It is one of the sally ports beneath Windsor Castle, originally built between 1217 and 1223. This is the South Bowe, which leads from near York Tower to the south of the castle. In the early years of World War II two chambers were excavated off this passage, about 35 feet underground. These chambers, each around 12 feet by 8, and lined with reinforced concrete, were used to store the Crown Jewels in safety until the end of the war. Photo Royal Collection Trust/© Her Majesty Queen Elizabeth II 2021. Photographer: Will Pryce*

Back page upper: *The assembled Sub Brit members outside the southern portal of Catesby Tunnel. Photo: Clive Penfold*

Back page lower: *The maintenance team outside Catesby Tunnel in 1913 - the exact location as the Sub Brit image above. Photo: courtesy Andy Smith*

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Newsletters of Subterranea Britannica are published by the committee of Subterranea Britannica. Original articles, book reviews, press cuttings, extracts from books and journals, letters to the Editor etc are welcome. However the Editor reserves the right not to publish material without giving a reason.

The committee of Subterranea Britannica and the Editor do not necessarily agree with any views expressed and cannot always check the accuracy of any material sent in.

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Chairman's Welcome

Tim Wellburn

Back in December 2020 – which now seems a very long time ago – I urged everyone to keep torch batteries charged because as soon as the world moved forward into broad sunlit uplands, Sub Brit would be heading back underground.

This autumn finally marked the turning point, celebrated by our first sortie out – a visit to the splendidly preserved St.Leonard's Court air-raid shelter in East Sheen (a trip proposed by Clive Penfold, and one we hope to repeat) – and by our Autumn Conference at Sywell, where I think everyone enjoyed the opportunity to catch up with old friends and perhaps make new ones.

Thanks to Ade Armishaw, the venue came with a superb aviation museum attached. The Conference was followed by a day out inspecting the Blisworth Canal Tunnel and then the entire length of the former GCR Catesby Tunnel, now a state-of-the-art automotive wind-testing facility.

Both the Sheen and Sywell visits show that Members' active engagement in Sub Brit really helps make things happen.

We plan to be going *sous terrain* in May, with a visit starting with two contrasting 1930s Belgian forts and then moving east to examine a set of Maginot Line *ouvrages*, ranging from the smallest to the biggest. We are also looking at the feasibility of, and options for, a Sub Brit European weekend. We will start rolling out a programme of UK day visits as quickly as we can gain access to sites.

I should like to repeat my thanks to everyone who took the time to complete the Members' Questionnaire. The response rate was 38 percent, which is a very good return for this sort of exercise, and gives us confidence that we have a sound foundation of Members' views as a basis for managing and developing Sub Brit.

The full results of the Survey are published elsewhere in this issue of *Subterranea*. The Committee is reviewing these in preparation for our January meeting, at which we plan to agree follow-up, which we will then present at the Spring Conference at Canada Water.

I'd particularly like to thank those of you who expressed willingness to help out in one or more ways. Committee members are getting in touch to discuss how best you'd like to take this forward.

Particular thanks are due to those Members who, having offered to write articles for *Subterranea*, received an urgent and short notice 'call to arms' from me when the Editor declared that this issue was still only 'half full'. The magazine you are now reading demonstrates how Sub-Brit's membership rose to the challenge, and speaks chapters about your commitment to, and consequently the strength of, the Society.

I wish you a relaxing Christmas break, with the prospect of an active 2022!

chairman@subbrit.org.uk

Maginot Line: Gros Ouvrage Fermont's armament was mounted in seven fighting blocks, the nearest of which was around a kilometre from the fort's entrances, necessitating an internal electric railway. This is still operational and used to convey visitors. Photo Tim Wellburn

SUBTERRANEA BRITANNICA DIARY

Summary of Forthcoming Events

2022

Sub Brit specific events

15 January Committee Meeting – Canada Water

19 February Reigate Caves visit

1 March Copy deadline for *Subterranea* 59

Visit to Dumpy Level, Dover Castle – postponed

April *Subterranea* 59 published

23 April AGM plus Spring Day Meeting – Canada Water

24 April Crossness Visit – after Spring Day Meeting

6 - 10 May Maginot Line visit – see page 4

Many more future events, including those previously listed in Subterranea 57 are under active planning and are subject both to sites emerging from Covid access restrictions and dates to be agreed

Other Underground Related Events

21 May - 7 June FSG/CDSG Sweden Trip

17 - 20 June NAHMO Conference 2022 “Industrial Minerals” Grosmont, North Yorkshire

September Hidden Earth Association (BCRA) annual caving conference Dates and venue to be confirmed

For web links to these events please visit *www.subbrit.org.uk/events*

If you know of other relevant events run by other societies, please let us know so that they can be advertised in the next edition and on the website

Subterranea Britannica

Notice of Annual General Meeting 2022

The AGM will be held on Saturday 23 April 2022, commencing at 10.00am
at Canada Water Theatre *(new venue**)*
in association with the Spring Meeting

Attendance is open to all current members of Subterranea Britannica

** Note: Every effort will be made to hold the meeting at this venue; however, if Covid-19 restrictions are in place at the time, it may be necessary to change the arrangements. This will be advised by email to all members*

Documents for the AGM will be available on our website at www.subbrit.org.uk at least 28 days in advance of the meeting. An email will be sent to advise this
Booking will be via the website at www.subbrit.org.uk/events
Documents will be sent to those members who have registered to receive them by post

Minutes of the AGM 2021 held in March, were printed in ***Subterranea*** **57**

**** Please note new venue ****
Canada Water Theatre (within Canada Water Library building),
21 Surrey Quays Road, Rotherhithe, London SE16 7AR
Two minutes walk from Canada Water tube station
on the Jubilee line (4 stops from Waterloo) and on London Overground

MEMBERSHIP RENEWALS

The New Year will bring thoughts of membership renewals. You will get an automated renewal reminder from the Sub Brit system just before the anniversary of your joining date (for many this will be the start of the new year). We'd be very pleased to see as many members as possible rejoining the society for 2022.

Although the pandemic continued to cause cancellation of some (most!) of our physical events, we hope that you have enjoyed the alternatives that have been arranged. The 'In the Dark' webinars have continued successfully through 2021, and we have regularly seen several hundred in the 'audience'. Our AGM also successfully took place online, while our Autumn Conference and day of visits in Northamptonshire actually happened in person.

We've also produced our regular three issues of ***Subterranea*** – all in full colour and with our usual number of pages. Well done to Nick and the team for these. The effort to put many new sites on the website is ongoing – but more would be welcome.

We look forward to welcoming you back next year when we hope to return to some more normality – running many of our usual live events, with a trip to Dover Castle and its historic tunnels planned in March and then our AGM and Spring Meeting in April.

Remember that this will be the last edition of ***Subterranea*** that you will receive if your membership expires at the end of December, unless you rejoin.

Here's the address to rejoin: https://app.sheepcrm.com/subbrit/login/

Sub Brit trip to the Maginot Line 6 – 10 May 2022

We have arranged a group booking to the Maginot Line with the tour company Leger, who specialise in Battlefield Tours. Here is the outline of the trip.

Day One Board coach in Ashford (TBC) for the crossing to the Continent. Drive through northern France and southern Belgium to the *Mercure* hotel at Liège in Belgium

Day Two We start with a full tour at **Eben Emael Fort**, assaulted by German Airborne troops in gliders. In the afternoon, we have a guided tour of **Fort d'Aubin-Neufchâteau**, completely surrounded in May 1940, and see the extensive damage caused. Drive through the Belgian Ardennes to Thionville, France, for 3 nights at the *Ibis* hotel

Day Three We start with **Maginot Fort Ouvrage Fermont**, a massive system of bunkers and tunnels which came under attack in May 1940. In the afternoon we see **Villy la Ferté**, a smaller Maginot Line construction. The site has been left as it was, and we have a fully guided tour around one of the few Maginot sites that saw heavy fighting

Day Four Today we explore **Ouvrage Immerhof**, with a guided tour and museum visit, followed by **Ouvrage Hackenberg**, the largest fortification on the whole Maginot Line. Finally we visit the cemetery at Luttange, where the first British soldier killed in WWII was buried

Day Five Return to the UK

The price is expected to be **£550** per person based on sharing a twin or double room (**£110** Single room supplement), which includes:

* Coach travel throughout

* Services of a Specialist Battlefield Guide

* Hotel accommodation as described above at *Mercure Liège* (one night) and *Ibis Thionville Porte du Luxembourg* (three nights) on a half-board basis with packed lunch each day

You must ensure that you have your own personal holiday insurance (required by Leger)

Gros Ouvrage Hackenberg, the largest work in the Maginot Line. In this view a spur off the internal electric railway leads into the locomotive shed. This is located near to the accommodation block and entrances to the fort. From here visitors travel on the railway to inspect some of the fighting blocks on the western side of the fort. Photo Tim Wellburn

Booking will open via the Sub Brit website in the New Year, at which point more details about payment procedures and sites will be available

Leger Holidays (www.leger.co.uk) is based in Rotherham and is fully ABTA bonded

Spring Meeting 2022

Saturday 23 April 2022, commencing at 10.25am, following the AGM
at Canada Water Theatre *(new venue)*

There will be the usual mix of interesting illustrated talks along with Members' contributions and a chance to meet and mingle with fellow enthusiasts

*****

Speakers currently lined up are:

* Emily Glass speaking on the **Albanian 'mushroom' bunkers**

* International expert Neil Hyatt will tell us about **Nuclear Waste Management** in the UK

* Robert Stephenson from Kensal Green and Brompton Cemeteries will cover **Premature burial tricks and traps**

* 4th speaker ─ to be confirmed.

Any changes to the line-up will be advised via the website and the Programme will be published on the website nearer the time

*****

Booking will be at www.subbrit.org.uk/events. Please make every effort to book in advance, as latecomers make logistics and catering difficult. Attendance at the Spring Meeting is open to all current members of Subterranea Britannica and to friends and relatives

Cost for AGM and Spring Meeting is £25, to include refreshments

*** ***Please note new venue*** ***

Canada Water Theatre (within Canada Water Library building),
21 Surrey Quays Road, Rotherhithe, London SE16 7AR.

Two minutes' walk from Canada Water tube station
on the Jubilee Line (4 stops from Waterloo) and on London Overground.

Note: Every effort will be made to hold the meeting at this venue; however, if Covid-19 restrictions are in place at the time, it may be necessary to change the arrangements. This will be advised by email to all members.

****

Visit to Crossness Pumping station

Sunday 24 April 2022, 11.00am

Crossness Sewage Treatment Works, Bazalgette Way, Abbey Wood, London SE2 9AQ

On the Sunday following the Spring Meeting, we have arranged a special visit for Sub Brit members.

The visit will last approx 2.5 – 3 hours and will include:

* an illustrated talk giving the historical context and build-up to the Great Stink of 1858

* a guided tour of the Crossness site and historic pumping engines

* the Great Stink exhibition and wonderful collection of toilets.

Cost of the visit will be £18, including tea/coffee/soft drinks and biscuits on arrival.

Booking will open alongside the Spring Meeting and AGM;
priority will be given to attendees of the Meeting.

Summary Minutes of Committee Meeting – 9 October 2021

The meeting was held online, which again worked successfully.

Participating: Tim Wellburn (in the Chair), Phil Catling, Chris Gray, Tony Radstone, Richard Seabrook, Bob Templeman, Richard West, Martin Dixon, James Buller, Linda Dixon.

Apologies for absence from: Neil Iosson, Nick Gould, Jason Hughes

Matters arising from Reports: Most of the Committee reports were posted to the Forum and discussed in the meeting.

- Richard Seabrook reported that he has received the USB drive back from Nick Catford with his digital photo collection. Nick's hard copy photos and negatives still need to be archived
- Committee approved the grant to the British Cave Rescue Council for £2,700; to be paid against an Invoice
- Bob handles queries to Sub Brit from the website; Martin will provide a list of known 'subject experts' to help get speedy answers.

Autumn Meeting (16 October 2021) and Visits (17th), Sywell, Northamptonshire

Phil thanked Tim, Martin, Linda, Tony, Richard Seabrook and Adrian Armishaw for their help and support in setting this up, in the face of numerous difficulties. 63 people have booked for the Saturday Meeting through Eventbrite; 46 for the Sunday visits. Martin and Linda will lead the visit programme on Sunday.

Spring Meeting and **Annual General Meeting, 2022** Now set for Saturday 23 April at Canada Water Theatre in London; Phil has three speakers lined up already. Tony will try and run the Crossness visit on Sunday 24 April.

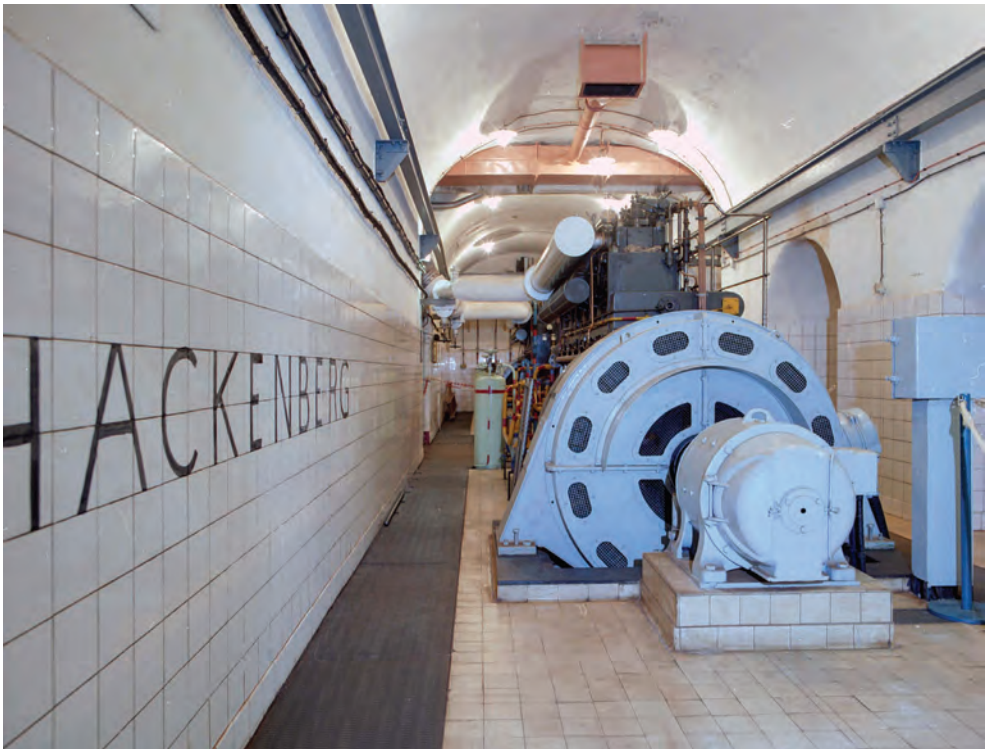
Autumn 2022 We are planning for a weekend in Edinburgh, based around Barnton Quarry. Neil is progressing this; date to be agreed.

Membership Questionnaire This was sent to all members in September; we were pleased with the response of 370 out of 977 paying members. A summary will appear in ***Subterranea*** in December and Neil will do some more analysis for discussion at the next Committee meeting in January.

"In The Dark" Webinars Thanks were given to Tony for arranging a new programme for the Autumn.

Trips and visits Thanks to Clive Penfold for proposing and Richard West for organizing a successful visit to St Leonard's **a**ir-raid shelter in East Sheen – we will try to repeat it. Other thoughts are being progressed – these will be announced to the membership once they are firmed up.

Next Committee meeting Saturday 15 January, 2022, in person at Canada Water Theatre 1100 – 1500 hrs. Main agenda item is analysis of Questionnaire.



The generator room in Ouvrage Hackenberg, one of the Maginot Line forts to be visited by Sub Brit in May 2022. Photo Nick Catford

NEWS

Miscellany compiled by Nick Catford

NEWS – ARCHAEOLOGY

Stunning Stone Age rock art discovered in Italy

A remarkable piece of Stone Age rock art featuring a depiction of a bird has been discovered in an Italian cave, among other artwork dating back up to 14,000 years. Archaeologists have been working in the Romanelli Cave in Apulia, Italy since 2016, but the first Stone Age artwork was found there over 100 years ago, in 1905.

Fieldwork inside Romanelli Cave.
The panels with art are in the top left

The Palaeolithic artwork includes a rare depiction of a bird, as well as bovids and geometric signs, say experts from the University of Rome. The images are part of an artistic tradition that stretched from the Iberian peninsula to France, but the new finds suggest this shared visual heritage spread even further. Radiocarbon dating revealed that the cave was in use for longer than expected and the images may have built up over millennia. A multidisciplinary team of archaeologists, geologists and palaeontologists in Italy made the amazing discovery within the cave, which is just 23ft above sea level.

While the cave was occupied during the Stone Age and rediscovered in 1874, difficulty accessing it meant it was not properly investigated for decades, with the first cave art only recorded in 1905. The rock art was not fully documented and was only supposed to consist of a few geometric signs, like ovals and fusiform, and one bovid.

This newly identified artwork includes a bovid, geometric signs, patterns made by tracing fingers through moonmilk – a soft white material that builds up in limestone caves – and a rare depiction of a bird, likely an auk. Although much of the artwork has deteriorated over time, the skill of the artists can still be seen.

Multiple tools were used to create the art depending on the surface being engraved and the bovid was carefully placed so that the shape of the rock would create a 3D effect. These new images, along with those previously identified in the cave, share many similarities with those seen in cave art from Italy, to France, and even as far as Spain or Azerbaijan.

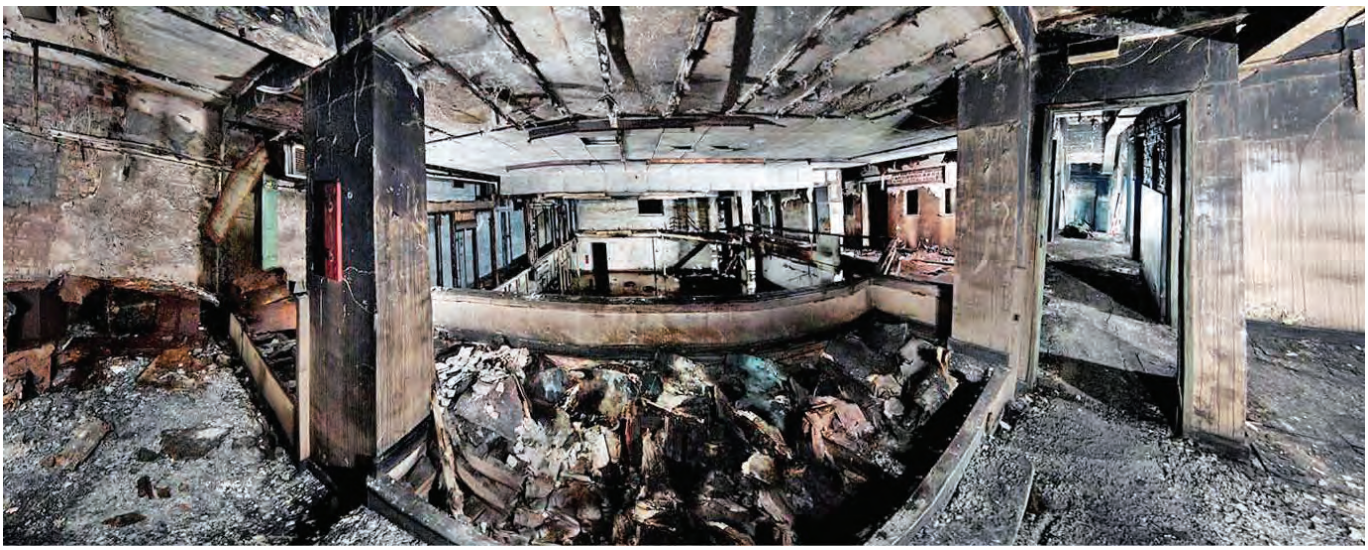
SOURCE: *MailOnline,* 13 October 2021

NEWS – CONSERVATION AND HERITAGE

Barnton Quarry RGHQ one step closer to becoming a visitor attraction

The Barnton Quarry RGHQ in Edinburgh is set to be converted into a unique visitor attraction. The military shelter was created just after World War II but has been neglected in recent years and now developers want to create the tourist attraction, with conference facilities, at Clermiston Road. The City of Edinburgh Council validated the proposal from the developer Scotcrown on 6 October, who promise that the Edinburgh shelter will be the only "such bunker in its original format anywhere in the world."

The Barnton Quarry Nuclear Bunker is located immediately to the East of Clermiston Road North and



The ops room well before any restoration work started

to the South of the depot, which is located in the North Quarry, itself accessed from the junction of Clermiston Road North and Queensferry Road. Scotcrown promise on the planning application that the local setting will not be damaged by their project.

They said: "The only impact of the proposals on the setting is that of the increased vehicular access and parking upon the surrounding woodland. By way of mitigation, it is proposed to add significant tree planting to the periphery of the site which will screen the parking and access roads. At present the edge of the site is open and the forecourt very visible from the nearby access routes within the woodland." The site has been vandalised over the years but the local community have been working to restore and hope the new project will serve the area for decades to come.

The site was first utilised as a quarry from the mid-19th century until the mid-20th century, with the bunker first being created in 1956 as the nuclear threat developed during the Cold War. It was operational until 1982 and after being sold to a private owner it was largely stripped of all its original contents and filled with illegally dumped material, primarily car tyres, which were subsequently set ablaze in 1993, resulting in the almost total destruction of all internal features.

However, the developer Scotcrown Ltd which is run by James Mitchell have experience converting such properties, as they also own Scotland's Secret Bunker, an underground museum, located near St Andrews in Fife. They now want to create a "historically accurate representation of the functioning bunker" in Edinburgh.

SOURCE: *Edinburgh News,* 13 October 2021

Clifton Rocks Railway named as a Top Ten hidden gem in England

The old funicular railway, near the Avon Gorge Hotel, was listed as one of the country's best kept secrets by the website *History Hits*. According to the website, it is the tourist site with the fourth lowest number of online searches, and has only been looked up on the internet 590 times. The tourist site with the lowest number of online hits was Kelvedon Hatch Nuclear Bunker in Essex, which has only been searched for 210 times.

Clifton Rocks Railway was built into the rocks of Avon Gorge and opened in 1893, before closing in 1934. It was then used as a secret transmission base for the BBC during World War II, but they gave up their lease in the 1960s. Since then it has remained empty, although The Clifton Rocks Railway Trust, which was formed in 2002, has opened it to the public on a handful of days every year, including the popular Bristol Doors Open Day.

And in 2019 it was bought by Bristol businessman Ian Johnson, who also owns the nearby Clifton Observatory. There were plans at the time to renovate the site and turn it into a museum, which would be open seven days a week.

The tiered air-raid shelter seating. Photo Nick Catford

SOURCE: *Bristol Live,* 7 August 2021

Sewers Museum in Paris open again after three-year renovation

After works lasting three years, a brand-new Sewers Museum will reopen in the French capital on 23 October. A new entrance building and stairway visible from the Seine will bring the sewers from the shadows into the light.

Does a museum devoted to the Paris sewers seem incongruous? Not at all, for the history of the sewers and that of the city are closely linked. The mysterious underground passages have always fascinated the public and attracted many visitors.

At the end of the eighteenth century, the drains in Paris are a real cesspool. Miasma and disease are spreading in the capital, which will suffer several epidemics of cholera throughout the century that follows. To say that the relationship of Parisians to their network sanitation has long been confrontational is to put it mildly! Groundwater and wells were contaminated by sewage in the streets or dumped in the Seine.

Many learned men and women considered the sewer problem, from its muddy state to its current sprawling network. Among these scientists, Eugène Belgrand holds a place apart. Summoned by prefect Haussmann to take charge of the Paris water service in 1854, he set up water catchments for source, and designed drinking and non-drinking water networks that would discharge through the sewers. He became Director of Water and Sewers in Paris in 1867, and created devices to ensure the proper functioning of the sewers, like cleaning machines, sluice-gates to trap large objects and grilles to catch rubbish.

Long before the creation of the Museum, there were organised tours of the sewers. Starting in 1867, the year of the Universal Exhibition, they were immediately a

huge success. On board a boat or a mobile sluice-gate, the tour was very popular and attracted a diverse audience including heads of state, royalty, people from all over the world in search of thrills, plus of course engineers on a study mission.

But it was only a century later, in 1975, that there would be a museum to tell the story of the sewers, its men and machines. Based by the Alma Bridge, the Museum offered a guided tour over 500 metres. Following redevelopment in 1989, the Museum welcomed around 100,000 visitors a year until it closed in 2018 for renovation. Now it is open again to showcase its underground marvels.

Visitor information: Musée des égouts, 93 Quai d'Orsay, 75007 Paris

Open daily except Monday, from 10h to 17h (last admission 16h) Tickets: from 7 to 9 euros

SOURCE: SFES newsletter and translation from *Visit Paris* website, 15 October 2021

New tenants found of the Harnham bunker in Salisbury

Salisbury City Council is pleased to announce that Underground Studios CIC will soon be the new custodians of the former Salisbury Urban District Council control centre at Harnham. The bunker started life as an old underground military telephone exchange buried in woodland on the outskirts of Salisbury.

Following an application process in June for new tenants at the underground bunker with a focus on provision for young people, Underground Studios CIC plan to launch an exciting programme of workshops, sessions and a creative youth club to The Bunker. This will provide predominantly young people with experiences and opportunity to learn and develop skills in music and digital media. The Underground Studios is a collaboration between Alex Mobaraki, Andy Munns and Naomi Payne who between them bring a huge amount of experience in these areas.

The Bunker will be renovated to create multi-use areas where many creative activities can be pursued. These include a Radio and Podcasting Studio, music practice space, a recording studio, TV studio and an IT and editing suite. There will be a chance for young people to learn about digital media in the forms of Radio, Podcasting,

Andy Munns and Alex Mobaraki at the Harnham Bunker

TV and Film as well as a journalism and digital media projects aimed at the wider community with a wider age range of participants.

The team at Underground Studios also wish to open their doors to other partner organisations working with young people and other sections of the community to develop a vibrant creative hub and maximise the space. The Mayor of Salisbury, Cllr Caroline Corbin said, "The City Council is delighted to support Underground Studios to bring the Bunker back into community use for the benefit of the community. We encourage all those interested to get in touch with the team and make the most of the opportunities at the Bunker."

Both Andy and Alex have joined the newly formed Youth Forum that has been put together by Sarah Gregson, the City Council's Communities Manager, and will be working with her to connect their exciting work. There are conversations already taking place with the City Council Communities Team, Wiltshire Creative and Wiltshire Council to increase provision through collaboration to provide more exciting opportunities for young people in Salisbury. For more updates and information check out The Underground Studios website – http://theundergroundstudios.co.uk or follow them on social media.

SOURCE: Salisbury City Council website, 5 October 2021

Visits to tunnels beneath Derby banned by the council

Derby City Council has called a stop to walking tours exploring tunnels beneath Derby city centre. Running through the Market Place, the Strand and other spots underneath the city of Derby, the ancient brick-lined routes once hosted walking tours.

Another tunnel was discovered as recently as 2009 behind a hidden doorway in the cellar of the Dolphin pub, in Queen Street. But the most popular route is one that is accessed from the Tiger bar in Derby's Lock Up Yard – between Corn Market and the Guildhall. For more than two decades ghost walks of up to 30 people would tip-toe into the pub's cellar and explore the spooky brick-lined passages.

The barrel-vaulted tunnels, made of two "corridors" measuring around 25 feet each, plus several large alcoves,

were once used to transfer prisoners to court. They are blocked off at the far end by a locked door – which is thought would lead on to many more secret passageways – maintained by Derby City Council. But in February last year the Tiger's landlord, Jonathan "Charlie" May, received a letter from a senior estates surveyor at the council. It said: "Following an urgent review of safety measures of visitors in the Guildhall tunnels, the council has regrettably had to make the decision to not permit any further walking tours of the tunnels for the foreseeable future.

"The council recognises the historic interest in the tunnels and is exploring opportunities to again open the tunnels to the paying public in a safe and secure environment." The tunnels under the Tiger have been completely closed to the public since that time.

"And why now?" asks Charlie, "It's been going more than 20 years. All of a sudden it's a health and safety risk. Thousands of people have been down these tunnels – I have never known an incident." Charlie said he would be happy to contribute half of the costs to fix any health and safety problems if the council would talk to him about the issues but he has heard nothing since their letter.

A spokeswoman for the council said: "The tunnels are closed and will remain closed until the Market Hall scaffolding has been removed and structural work has been completed in 2021. At that point, a decision will be made whether the tunnels can be reopened."

SOURCE: *Derbyshire Live,* 11 August 2019

NEWS – HEALTH AND SAFETY

Trains crash inside the Fisherton Tunnel near Salisbury

British Transport Police has said a senior detective is now leading the investigation into the horror crash inside the Fisherton tunnel, near Salisbury, on 30 October. The carnage inside the smoke-filled carriages left 17 people hurt, including several with broken bones. Around 70 more people, including a baby, needed rescuing and the driver was taken to hospital with life-changing injuries. Passengers fearing they were about to die had called loved ones to say goodbye as investigators probe how a busy locomotive was a 'sitting duck' for seven minutes before a second high-speed service careered into it when signals failed to turn red. Passengers on a Great Western Railway service from Portsmouth Harbour to Bristol Temple Meads were thrown around their pitch-black carriages after their train 'jolted' to a halt in the 1857-built Fisherton Tunnel in Salisbury, sending it off the rails as it entered the 430-yard underpass at around 6.38pm.

Around 50 people were stranded on the derailed train for seven minutes before a South Western Railway service from London to Honiton with around fifty people on board ploughed into the stationary train at around 6.45pm.

Passengers on the first train described feeling a 'jolt' and 'bump' before the train stopped and early reports in the aftermath of the incident said that the first train was derailed after striking debris on the track after heavy rain and strong winds swept across the country yesterday. One woman on the train said a rumour amongst passengers was that the first train could have been thrown from the track after hitting part of a fallen tree or a piece of stone from the tunnel.

But BTP today said that they have not yet found evidence of this, raising serious questions about how and why the GWR train was stationary at the time of the crash. The driver of one of the trains, containing many teenagers and families returning home after half term, was trapped in his cab while others on board broke noses and feet as well as suffering severe cuts and bruises. But remarkably no one was killed.

Those on board the trains described a huge bang like a 'bomb going off' when the collision happened, followed by flying glass, sparks from the grinding metal and even tables flying across the carriages. Firefighters and paramedics rescued around 120 people, including a three-week-old baby.

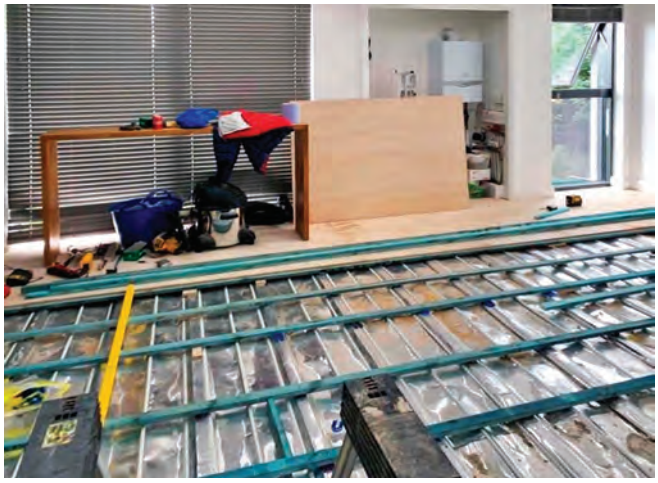
SOURCE: *Mail Online,* 1 November 2021

NEWS – MILITARY AND DEFENCE

Floor collapses in new Mistley AAOR flat

A resident who bought a flat in the recently converted former AAOR bunker at Mistley was left frustrated after his home had to undergo substantial repair work. Matt Lowes was hoping to get the time of his life in his new one-bed flat but was instead given bowing floor and bubbled kitchen units. Mr Lowes moved into one of the restored flats on Shrubland Road, Mistley last December, after spending years saving up for a deposit. But not long after he set foot in his £150,000 one-bedroom flat, the floor starting falling though.

Developers Build Vantage had converted the nuclear bunker, originally built in 1951, into three plush duplex apartments. Mr Lowes, who is an estate agent himself, had to get the company to relay his floor, but claims he now has almost no insulation and soundproofing.



Floor being repaired in the bunker flat

Before the repairs were done the flooring was bowing and getting worse and worse up to the point where his neighbours were saying they could hear him when he was walking around. Mr Lowes further claims he was given a day's notice to move out while his flooring was being redone. He said he had to spend around nine days in a hotel while work in his apartment was underway, which caused him a great amount of anxiety.

Mr Lowes said he feels he has no privacy because of the thin insulation, claiming his neighbours can hear him cough, walk around his flat, flush the toilet or watch TV. Now that the old flooring has been taken off and replaced, Mr Lowes said he found out there are power units below his sink, which also makes him fear for his safety.

SOURCE: *Essex County Standard* , 18 October 2021

Queenborough, Kent WWII and Cold War sub-control demolished

The Queenborough Civil Defence Control Centre was built during WWII at the rear of the Guildhall. It consisted on a single-storey brick building with a concrete roof. The control was reactivated in 1955 as a sub-control reporting to the Area Control at the Dane John Council offices in Canterbury. The sub-control was closed in 1968 when the Civil Defence Corps was abolished. When controls were reactivated in the 1980s the building was not reused, the whole of Sheppey being covered by the Swale Council Emergency Centre in Sittingbourne.

The sub-control appeared derelict in August 2015. Photo Andy Hebden

The Guildhall remained in use until 1974 with the formation of Swale Council. When visited by Sub Brit in 2002 the Guildhall had become the local Conservative Club. The former sub-control was used by Abbott Laboratories Ltd and the only access was from their car park but it had recently been sold. When visited in 2015 the building was derelict but secure. Google Streetview in May 2021 shows the building has been demolished with a new building under construction on the site.

SOURCE: David Taylor

Czech Republic sells thousands of WWII bunkers

The Czech army has been selling thousands of military bunkers that were intended to prevent a Nazi attack in 1938. In the process, a unique defence system of almost 5,000 fortifications is in danger of being destroyed. In the late 1930s, what was then Czechoslovakia built an extensive network of fortifications along the border with what was then the German Reich. Prague feared that the Germans would launch a surprise assault and overrun the country's defences before there was time to mobilize the army and reserves.

Although the fortifications were not fully completed by September 1938, together with the mountain ranges in the border area they represented an important hurdle for the Wehrmacht and one that the Nazi generals came to fear. Though the government in Prague had mobilized 1.1 million soldiers, and its army was ready to fight and defend itself, British Prime Minister Neville Chamberlain and his French counterpart, Edouard Daladier, concluded an agreement with Adolf Hitler in Munich on September 29 and 30, 1938.

It obliged Czechoslovakia to cede to the Third Reich almost the entire border area with Germany, where a large German minority lived at the time. That meant that practically all Czechoslovak border fortifications and concrete bunkers fell into the hands of the Nazis. Without them, the country was militarily powerless. This helped the Nazis occupy the remaining parts of the country on March 15, 1939. Paradoxically, the border fortifications

later helped the German occupiers to defend themselves from the Red Army in the spring of 1945. Fighting on the fortified border significantly slowed the Soviet advance and cost the lives of thousands of Soviet soldiers.

German troops inspecting the fortification after occupying the Czech Sudetenland in October 1938

Some eight decades later, the concrete defences continue to mark the Czech countryside, silent witnesses to the country's intention to go down fighting against the Nazis, if need be. Since 2000, Czechoslovakia's legal successor, the Czech Republic, has been gradually getting rid of the fortifications. The Czech army can transfer them to regions or municipalities, as well as sell them to private individuals. The Czech army plans to sell virtually all fortifications or give them to regions and municipalities for free.

The army will keep only a few buildings for its own purposes, such as storage facilities. Among them are mainly larger fortress buildings. The army wants to keep one of them, for example, because it houses a seismic station for monitoring nuclear explosions.

Every year, more border fortification bunkers are offered for sale on the Czech army's website. The prices usually range from €1,000 to several tens of thousands of euros. The most common small fortification is the *ropik*. However, in some particularly attractive areas, such as the wine-growing region around Mikulov in southern Moravia, this bunker, including the land, costs four times as much as in others. Since the facilities are sold at public auctions, the final price can be even higher. Nevertheless, the interest in buying bunkers is increasing.

Some of the structures have already been renovated and turned into museums that are now drawing tourists from the Czech Republic as well as from abroad. The most visited site is the Hurka artillery fortress on the northern outskirts of Kraliky, at the foothills of the Sudetes mountain range near what is now the northern border with Poland.

SOURCE: *DW News* (Germany), 26 September 2021

Camberwell's new Cold War bunker garden

Located above the now disused Southwark Borough Control bunker, the Camberwell Bunker Garden can be found on the corner of Vestry Road and Peckham Road, London SE5. Below ground can be found the remains of one of the borough control centres constructed during the Cold War as a place to continue local government during an attack. The land above now serves as a community garden, and the Camberwell Bunker Collective have outlined their plans for the site:

This will be an exciting new visitor attraction in Camberwell, created by the restoration of the Cold War nuclear bunker, on the corner of Vestry Road and Peckham Road. Created by, with and for Camberwell but to share with the world.

Below ground: Restore the bunker to its previous condition and then use it as a site for exhibiting art with political, protest or dissident content.

Above ground: A new museum for London, retelling the Cold War narrative affecting all continents and all peoples.

For our community's needs: A site to provide opportunity for work experience and training, from giving young Southwark architects an opportunity to shine, to providing customer-facing experience for the long-term unemployed, in partnership with local organisations.

For our diverse population: To see our own stories told in post-war context and to understand each other better.

For our artistic community: Curatorial Partnerships with local institutions.

For History: To educate, understand and create the historians of the future.

SOURCE: *Brixton Buzz,* 26 August 2021

Nuclear bunker may need to be built if SNP remove Trident from an independent Scotland

Professor Malcolm Chalmers of the Royal United Services Institute claims contingency measures to construct bunkers across England include locations in the southwest of England, but stressed Trident and the warheads must be moved together from the Clyde HM Naval Base (Faslane) in the event of Scotland voting for independence, although he warned such a move could take decades.

Professor Chalmers explained how Devonport in Plymouth, despite its being a location earmarked by the Ministry of Defence as a possible option to house the UK's Trident programme, is not suitable to store warheads. He explained that this is due to the vast populations that surround the immediate area and thus the southwest location is not safe for storage.

The weapons expert went on to say that as a result of not having any location in place that would be suitable for storage, Britain would have to construct a new set of nuclear warhead bunkers. He added how one suggestion for a possible location, which he himself made to the British government, is the Fal Estuary near Falmouth.

HM Naval Base Clyde (Faslane)

The nuclear weapons expert explained how the location is smart given the low population in the area and as a result, security can be tightly controlled. But he warned how building a whole new facility is going to take "a decade or more" and simply cannot be done quickly. He was also quick to dismiss the idea of moving one facility without the other, for instance: leaving nuclear warhead storage in Scotland and moving Trident out.

Despite the desires of the SNP, a spokesman for the UK government said they were strongly committed to maintaining the £5 billion Trident nuclear programme as a deterrent against nuclear threats to the UK and NATO allies. The Campaign for Nuclear Disarmament has estimated the cost of this to be at £205 billion.

Jackie Baillie, the Labour MSP who represents Dumbarton, said: "The SNP are happy to simply move Trident over the border without a thought for the jobs and the impact on the local economy. The UK currently has around 195 warheads in an ocean-based fleet of Vanguard-class ballistic missile submarines, but Prime Minister Boris Johnson intends to push the UK's stockpile up by forty percent to "no more than 260 warheads".

SOURCE: *Toysmatrix,* 25 September 2021

Swiss government built nuclear hideout in West Cork during the Cold War

With tension between the US and North Korea mounting, Skibbereen, in West Cork, Ireland has been identified as one of the safest places on the planet, given the presence of a nuclear bunker at the lake-front property, which is located just 3.5km from the town centre. In the early 1970s, the estate was bought by the Swiss government and a purpose-built bunker was installed in order to create a bolthole for governmental officials seeking to flee from the threat of nuclear war.

Secure behind its high gates on the Tragumna Road, the house has always been, and remains to this day, comfortably grand and its beautiful walled garden continues to produce vegetables for the main house. Today, Liss Ard Estate offers luxury accommodation to paying guests – as well as operating as a retreat for the rich and famous like Bono, Star Wars actor Mark Hamill and Gabriel Byrne to mention but a few – but the owners are also happy to allow it to be the venue for a variety of community events, such as SCAR and the Down and Dirty race.

Liss Ard Estate

Back in the 1970s, hi-tech computers were installed at Liss Ard for governmental purposes, and rumours abound of strong rooms and vaults that were designed to store Swiss gold reserves. Recent visitors will attest to the fact that there is no gold bullion lying around the place, and the new owners are remaining tight-lipped about the location of the nuclear bunker because, for them, it is 'business as usual.'

It was in the 1980s that the Swiss government arrived at the conclusion that a nuclear war between the US and the USSR was no longer a threat, so they sold the property.

SOURCE: *Southern Star* 29 August 2021

World War One trench recreated in Kent woodland

A replica World War I trench has been built in Kent woodland to help educate people about the conflict. The trench, which includes sleeping quarters, a command centre and toilet, has been set up near Maidstone. It has been designed by military historian Andy Robertshaw who worked with Steven Spielberg on *War Horse* and Sam Mendes on *1917*.

It is being used to teach children and serving soldiers what life was like for troops who fought in the conflict. Mr Robertshaw said: "We're doing this to give people an idea of the experience of living in a trench. We're talking here about eating, sleeping, drinking and going to the toilet."

Mr Robertshaw, whose grandfather was an army private between 1916 and 1919, has previously built four other trenches, including one in his back garden. The trench is over 328ft long and 6.5ft deep, and is manned by re-enactors wearing authentic uniforms and equipment.

SOURCE: *BBC News,* 19 October 2021

Watton, Norfolk Uniter bunker to be sold

A huge blast-proof bunker set in over an acre of land went under the hammer at auction in November, priced at a guide of £200,000. The 5,300 sq ft bunker off Portal Avenue in Thetford was built in 1990 as a UNITER communication station to RAF Watton.

UNITER was the project name for a new communications network which replaced a number of other voice and data networks that had become obsolete, and provided on-site communications support to RAF stations. Due to its purpose, the building, which sits above ground, is hardened with blast-proof concrete to resist direct attack from weapons such as missiles and features a three-inch high-security steel access door.

It's thought that the bunkers, and others like it, were intended to be completely self-contained for up to three months. When operational, they had their own oil-fuelled generators, air conditioning and water supply. The bunker ceased operation in 2002, although its former working areas, which extend to almost 10 ft, are still in situ, as well as a walk-in vault, storage rooms and a cloakroom area.

It sits in a plot of 1.55 acres and adjoins land on the former RAF Watton airbase. Some of the surrounding land has already been sold for residential use, with more to follow.

SOURCE: *Eastern Daily Press,* 20 September 2021

Reading Regional War Room is a no-go area

It's fair to say, in the event of nuclear war breaking out, the people of Berkshire might be in a spot of bother. It's a well-known fact that there are not one but two very much not top secret Atomic Weapons Establishments within a few miles of each other – and a few miles of Reading. This fact was acknowledged back in the 1950s, during the early stages of the Cold War – and a bunker was commissioned for the area.

The University of Reading's Whiteknights Campus was the site chosen for the bunker. It was built big enough to house the Regional Commissioner and 50 staff during an attack. The idea was that if central government was lost, the response to the attack would be co-ordinated from the shelter in Reading. It had a map room, control rooms, satellite cabins, offices, a communications room, dormitories and even a canteen that would've been used in the event of an attack. However, in 2021, it is a no-go zone.

Reading Regional War Room. Photo Nick Catford

A spokesman from the University said no one is allowed in except experts in full protective gear who go in from time to time to inspect the condition of the building. History professor Patrick Major said of the bunker in 2017 that it could well be the case the bunker is useless, even if it was safe. "The big problem for Reading was that if war broke out, the big target for the Russians would be just down the road in Aldermaston, as that's where they made nuclear bombs.

"That was probably the number one target for the Soviet Union and it [the blast] would probably have gone all the way to Reading. The other problem would be the fallout. The bunker was designed to withstand the blast and enable the people inside to survive the fallout, which is contaminated dust that, if inhaled, causes radiation poisoning. But I think it was obsolete as soon as it was finished. When it was finished in '53, the Americans tested the first hydrogen bomb and the Soviets tested theirs soon after that. It was designed to withstand a Hiroshima-style atomic bomb."

He added: "It just looks like a pebble dash concrete building; you wouldn't know there is a nuclear bunker in there. But there are vents at the top, which are part of the filtration system."

The bunker was used by the university's library as a storage facility. Plans were made in 2007 to knock it down and use the land for a car park, but it had become a Grade II listed building at that point. Historic England describes the bunker as "A remarkably intact early 1950s war room which has experienced very little in the way of alteration since built. A building which expresses

through its monumental and robust form the threat posed by the atomic bomb. It is one of only thirteen war rooms nationally of the early 1950s and one of only four surviving in England built to the two-storey semi-sunken design."

[Note: When visited by members of Subterranea Britannica in 2001 no protective clothing was required to go into the bunker. It would appear that the university are being unnecessarily cautious or perhaps they are using health and safety as an easy way to say 'no' to visits.]

SOURCE: *Berkshire Live,* 30 October 2021

Hidden WWI bunker revealed as glacier melts in Italy

Researchers have recovered a treasure trove of World War I artefacts from a cave shelter in northern Italy revealed by the melting of a glacier. During the war, the cave shelter housed 20 Austrian soldiers stationed at Mount Scorluzzo on the Alpine front, close to the famous Stelvio Pass. While people knew the shelter existed, researchers were only able to enter it in 2017 as the surrounding glacier had melted.

Inside they found food, dishes and jackets made from animal skins, among many other items. The artefacts illustrate the very poor standard of daily life of the soldiers, who had to deal with extreme environmental conditions. Winter temperatures in the region could drop to -40C. Soldiers had to fight against the extreme environment, fight against the snow or the avalanches, as well as fighting the enemy.

More items are appearing annually in the area as the glacier continues to melt. Five years ago the bodies of two soldiers were found, along with documents that allowed them to be identified and their remains given to their families.

The artefacts from the cave shelter are being preserved and will form part of the collection, due to open in late 2022, at a museum dedicated to World War I in the northern Italian town of Bormio.

The shelter was occupied in the first days of the war by Austrian troops, who made it completely invisible from the Italian side or from aerial observation, according to a statement from the White War Museum, located in Adamello, Italy. It sits at an altitude of 3094 metres, just below the peak of Mount Scorluzzo, and excavation work has been carried out each July and August since 2017, removing around 60 cubic metres of ice from the cave. A total of 300 objects were recovered, including straw mattresses, coins, helmets, ammunition and newspapers. "The findings in the cave on Mount Scorluzzo give us, after over a hundred years, a slice of life at over 3000 metres above sea level, where the time stopped on November 3, 1918, when the last Austrian soldier closed the door and rushed downhill," the museum said in a press release.

SOURCE: 9News Sidney 6 May 2021

More evidence of missile silo sites under construction in China

After the discovery during the summer of what appears to be at least three vast missile silo fields under construction near Yumen, Hami, and Ordos in north-central China, new commercial satellite images show significant progress at the three sites as well as at the People's Liberation Army Rocket Force (PLARF)'s training site near Jilantai.

The images provide a vivid and rare public look into what is otherwise a top-secret and highly sensitive construction programme. The Chinese government has still not officially confirmed or denied that the facilities under construction are silos intended for missiles and there are many uncertainties and unknowns about the nature and role of the facilities..

Yet analysis of hundreds of satellite images over the past three years of the suspected missile silo fields and the different facilities that are under construction at each of them have increased confidence that they are indeed related to the PLARF's modernisation programme. In recent analysis of new satellite images, almost weekly progress in construction of suspected silos as well as discovered unique facilities that appear intended to support missile operations once the silo fields become operational has been observed

This short dome shelter has been extended

Apart from hiding silo details from satellites, these environmental shelters play an important role in the construction process: winter temperatures in areas like the Jilantai training area can reach below -25 degrees

Celsius and pouring concrete in cold temperatures can cause it to freeze and crack. Additionally, many of China's suspected silo sites are located in desert areas with periodic sandstorms.

Spring floods are another challenge, so many silo sites and roads are elevated above the ground level and often with barriers or tunnels to prevent water damage. Environmental shelters, therefore, help keep construction running smoothly and on schedule year round, and they can be erected and dismantled in just a couple of days.

Interestingly, China appears to be experimenting with several different types of shelters for each of its suspected silo fields. The reason for this may have to do with practical construction issues rather than what is being constructed under them. In addition to these sites, 11 identical solid structures have been erected at the suspected Yumen missile silo site.

The new satellite images show features that reaffirm that the sites appear to be silos in various stages of construction. A few satellite images taken at sites before the shelters were built already showed features strongly suggesting the sites were missile silos, and the first four sites at Jilantai are clearly silos.

SOURCE: *Federation of American Sciences*, 2 November 2021

NEWS – MINES AND MINING

Update on the race to grab all the UK's lithium before it's too late

Hidden in hills by St Dennis in Cornwall, a short drive away from the mining village once known as the richest square mile in the world, lies a gigantic hole in the ground. This is not unusual; the area is pitted with hundreds of old and abandoned mines where for almost 300 years tonnes of copper, tin, tungsten and clay were taken from the earth. What is odd, at least in 2021, is the noise coming from it: the steady sound of digging.

Finding the source of the sound involves a cautious ascent on a rocky path to the mouth of the Trelavour Downs, where dense vegetation gives way to a stark landscape ripped apart by heavy machinery. Entire chunks of land are missing, leaving behind white craters where hills abruptly turn into chasms. On a bright day, looking at the white walls is like gazing into the sun.

Cornish Lithium is one of two local companies – the other being British Lithium – that believe that this shiny metal could be a new gold rush for Cornwall; an opportunity to revive an industry that waned decades ago and left many of the traditional mining villages impoverished.

But their mission is bigger than that: they think these deposits could unlock the UK's electric dreams, making the extraction of lithium and manufacturing of lithium-ion batteries possible in the country for the first time, reducing the substantial ecological footprint of current battery technology. They believe there could be enough lithium in Cornwall to meet UK demand when the country moves from fossil fuel vehicles to electric ones – they just have to find a cost-effective way to get it.

To extract lithium from Trelavour Downs, the four-strong Cornish Lithium mining team is making a hole every few metres using a drill rig, with almost 1,500 metres of diamond and 2,500 metres of 'reverse circulation' drilling planned. The rig pushes deep into the ground and inserts gallons of pressurised water to lubricate it and extract drill cores from the granite.

Cornish Lithium advances Trelavour hard rock lithium project

The cores, perfectly-shaped stone cylinders about a metre long and roughly the diameter of a table-tennis ball, are passed to members of the team to tag, examine and crush to release the lithium contained within. This takes a lot of energy: around five per cent of the electricity generated globally is spent crushing rocks in lithium mining.

The team uses technology licensed from Australian company Lepidico to process the samples on site, without the need for further refining. Cornish Lithium says it is progressing towards bulk metallurgical testing to handle many samples of lithium at once and plans to construct a pilot test plant to ramp up processing.

But hard rock is not the only place where lithium can be found. Naturally-occurring underground hot springs in Cornwall are enriched with geothermal fluids called brines, which contain minerals leached out of the granite in the Earth's crust. Alongside hard rock extraction, Cornish Lithium plans to use direct lithium extraction in the brines, which will allow it to selectively extract the lithium by putting the liquid through a series of filters. Ultimately, the company aims to produce a battery-quality lithium hydroxide product from the geothermal waters.

SOURCE: *WIRED,* 5 October 2021

Four Canadian miners trapped one mile underground

Four of 39 miners were trapped one mile underground after a scoop bucket that brings them to the surface detached and blocked a Canadian mine shaft early on 26 September. The trapped workers in Totten mine in Sudbury, Ontario, went to refuge stations – as part of protocol – where there is food and water and the ability to contact loved ones.

Totten Mine

By Tuesday evening, only four miners remained underground. One of the miners was higher up than others so his trek up the ladder to safety was shorter. The miner was at the 1,850-foot level when he began to climb and it took him about two hours and 50 minutes, with breaks about every 40 feet to take a breather on one of the landing areas. The company said miners who were unable to climb the long ladder ascent would be pulled up using ropes.

The Totten Mine opened in 2014, in Worthington, Ontario, and produces copper, nickel and precious metals. It employs about 200 people. In the first six months of 2021, Totten mine produced 3,600 tons of finished nickel.

SOURCE: *MailOnline,* 28 September 2021

Mine rescue in Cumbria

In April 2021 Cumbria Ore Mines Rescue Unit were called by Teesdale and Weardale Search and Mountain Rescue Team to assist Durham & Darlington Fire and Rescue Service to rescue three people from High Skears mine near Middleton-in-Teesdale. The trio had got into trouble when attempting a through trip in the mine.

High Skears mine adit

Two of the people were able to exit the mine with some assistance while the third was unable to climb up an internal shaft and was hoisted up by team members, and then helped out of the mine. The rescue, near Barnard Castle, County Durham, was led by the COMRU who had 15 team members and both their team vehicles there. In addition to the Mountain Rescue team and Fire Service, North East Ambulance Service and their HART Team was also on scene.

SOURCE: *Below* – Journal of the Shropshire Caving and Mining Club, Spring 2021

Almost 300 Coal Tips in Wales classed as 'high-risk'

Following the 60,000-tonne landslip last year at Tylorstown, in Rhondda, the Welsh and UK governments, the Coal Authority, local councils and other bodies have been examining the problem of coal tips. Their investigation has concluded current legislation surrounding tips is "neither sufficiently robust or fit for purpose in relation to inspection and maintenance."

Since the Tylorstown slip a lot of work has been done to map tips and assess their stability. The results reveal that Wales has more than 2,000 coal tips. Most are on private land and most are around the south Wales valleys. Of those, 294 are categorised as "high-risk", meaning they could endanger life or property. Seventy are in Caerphilly, 64 in Rhondda Cynon Taf, 59 in Merthyr Tydfil, 42 in Bridgend, 35 in Neath Port Talbot, 16 in Blaenau Gwent and eight in Swansea.

A tip above Tylorstown partly collapsed during the storms of February 2020, sending 60,000 tonnes of waste tumbling into the river. Photo Francesca Jones

The matter was discussed at a Welsh Movement online summit on mine safety on 16 February. It also discussed the wider issues of mine safety after flooding in Skewen, Neath Port Talbot in January. Any tip of old mining material sitting on a hillside can pose a risk, but the key thing to their safety is to manage water and keep it away. The UK movement has committed £9m, from its £31m Welsh flood relief fund to 'repair' vulnerable coal tips.

SOURCE: *BBC News,* 16 February 2021

Test drilling set to restart at Anglesey copper mine

A drill rig has been installed at an Anglesey copper mine and test drilling is set to restart. The work at Anglesey Mining PLC's Mynydd Parys site near Amlwch, once the biggest copper producer in the world, follows the company's recent fundraising. But there have been many false dawns, with several previous attempts to restart production failing to materialise. With the drilling at Parys Mountain expected to commence the company expects to have results "during (the first quarter) of 2022."

The nine-hole diamond core drilling programme was designed to provide additional information for a planned feasibility study in 2022. The 2,750-metre drilling programme will also provide geological and technical information to be used in the mine design and additional metallurgical tests from two zones on the hillside.

Field testing at Parys Mountain

Copper has been mined at Mynydd Parys since the early Bronze Age. By the eighteenth century the mine dominated the world's copper market when its copper was used to sheath the British Admiralty's wooden ships of war, to prevent the growth of seaweed and barnacles.

Over the years, a number of environmental studies and permitting activities have been carried out in the area resulting in planning permission being granted in 1988 to restart mining operations at 350,000 tonnes per year.

In addition to its Mynydd Parys holding, Anglesey Mining holds a financial interest and management rights to the Grangesberg Iron project in Sweden and 12 percent of Labrador Iron Mines Holdings Limited which has iron ore deposits in Canada.

SOURCE: *NorthWales Live,* 15 November 2021

Should Wales shut its last remaining coal mines?

Wales is digging serious amounts of coal despite the climate emergency declared by the Welsh Government.

With COP26 underway in November there is a huge focus on the unfolding climate disaster we are all living through. The burning of fossil fuels by humans is warming our planet at a deadly rate which is already having a direct and visible impact on our planet. Coal is the most dangerous of all the fossil fuels, producing more carbon emissions that natural gas or oil. It also causes the most deaths from accidents and air pollution.

The Welsh Government has been vocal in its determination to tackle the issue. After May's Senedd election they created the role of Climate minister and put a great deal of powers in that brief, including decisions on future road building. The new minister Julie James has already made the ambitious aim that there will be no gas boilers in Wales by 2030.

But there is a very serious issue with these visions of Wales becoming a beacon of climate-friendly policies and green energy. The issue comes down to coal and steel. Despite grand plans, coal is still being mined from Welsh soil. Despite the fact we know that it is the very extraction of these fossil fuels that is driving the current mess, the coal from under our feet is still being removed.

Where is coal still being extracted in Wales?

One of these places is Aberpergwm drift colliery, near Glynneath and there is another in the Ffos-y-fran open-cast mine in the northeast of Merthyr Tydfil. Why are we still mining coal in Wales?

The Welsh Government says it doesn't want this to be happening. Speaking in the Senedd in November deputy climate change minister Lee Waters accused the UK Government of hypocrisy over allowing the continued production of coal.

He said: "We've heard, at the COP in Glasgow, the Prime Minister saying that the UN needs to move away from coal, but that is the opposite of what the UK Government is doing. It's the current policy of the Government that the Coal Authority has a duty to support the continued extraction of fossil fuels. That is not what we want to do in Wales; we have a very clear policy of stopping using fossil fuels."

He added that the Welsh Government had requested the UK Government cancel the licence for the extraction of the coal and said that if they failed to act by 2039, 100 million tonnes of carbon dioxide would have been released because of the mine. However in response to this the UK Government has said that the Welsh Government have the power to decide if coal mines are given a licence.

Aberpergwm Colliery

The licence for coal extraction at Aberpergwm was originally issued in 1996 after the mine had been closed by the National Coal Board in 1985, and then varied in 2013 to expand the mineable area, subject to achieving planning permission. The Welsh Government claim that these decisions followed UK Government policy, within the remit the UK Government set for the Coal Authority to secure an economically-viable coal mining industry.

Aberpergwm mine is Western Europe's only producer of high-grade anthracite with some of that which is mined going to Tata steel plant in Port Talbot. It employs 160 people in the Vale of Neath area plus 16 apprentices. Wayne Evans, NUM general secretary for south Wales,

said that if the colliery was shut, steel companies would have to import coal instead from Indonesia or Australia, halfway across the world.

SOURCE: *WalesOnline*, 7 November

New Zealand mine explosion: Bodies found 11 years after blast that killed 29 men

Human remains have been found in a New Zealand coal mine more than a decade after one of the country's worst industrial disasters, police have said. Twenty-nine men were killed after a series of methane gas explosions ripped through the Pike River mine on the west coast of the South Island in November 2010. Two workers managed to escape. Entry was banned to the mine for years – and it was permanently closed due to safety concerns.

In 2019, nine years after the incident, investigators were allowed access following calls from the families of the miners. Police said pictures taken confirmed two bodies had been found, with the possibility of a third, during a search in the mine last week. However, the remains were far from the mine entrance and could not be recovered.

Detective Superintendent Peter Read said: "While we have been unable to identify the remains, we are working with forensic experts to see what we can do to confirm their identities." He added that investigators believe there were six to eight people working in the area where the remains were found.

The fire at Pike River mine following the methane explosion in November 2010

Two years after the blast, a Royal Commission report found that the Pike River Coal mining company ignored 21 warnings that methane gas had accumulated to explosive levels before the fatal blast. It found broad safety problems and said the firm had exposed miners to unacceptable risks to meet financial targets.

At the time of the disaster, there were only two mine inspectors who were unable to keep up with their workload, it said. Former New Zealand Prime Minister John Key said: "The company completely and utterly failed to protect its workers."

The workers were around 5,000ft from the mine entrance when the explosion took place. Further blasts occurred and the men were presumed to have been killed.

SOURCE: *Sky News*, 17 November 2021

NEWS – MISCELLANEOUS

Last steam train on the London Underground

All good things come to an end, and that was the case with the age of steam on the London Underground and overground railways. Engineers used conventional steam locomotives on the Underground, but the solution was to fit special pipes to condense the exhaust steam into side tanks of cold water. This meant less steam in the tunnels, but smoke was still a problem.

Coke fuel was used instead of coal as it creates less smoke, and there were 'blow holes' at intervals around the railway, but the atmosphere underground was still very unpleasant and the smoky atmosphere in the tunnels sometimes sent passengers coughing and spluttering into the streets or, occasionally, to the pharmacist near Euston station who sold glasses of 'Metropolitan Mixture' to soothe damaged mouths, throats and lungs.

So, ever since the late 1800s and the days of the City and South London Railway, there had been a move to electrify lines – especially deep underground ones where steam was so filthy and smelly. This carried on apace and gradually the beautiful steam engines that had been such faithful servants were withdrawn and replaced with electric trains running on the notorious third rail.

Steam locomotive L94 on a commemorative run from Barbican to Neasden Depot marking 'The last steam train on the Underground' in 1971

The Metropolitan line was also the last to lose its steam trains – largely because so much of it was above ground. The last steam locomotives ran on this line in 1961. But even after this, there was some steam still in operation. These trains were run by London Transport from the Lillie Bridge depot near Earl's Court and were for engineering works or train company business. One ran in the daylight hours to Acton Yard while another two ran at night. One service ran to Neasden via Rayners Lane in West London and another to Upminster via Victoria, Whitechapel and Barking.

Many more of these so-called 'departmental' trains had previously run on the lines at night after ordinary passenger services had finished. These continued in use until 1971. In that year when the last steam train ran, a special commemorative train ran from Barbican to Neasden.

Many train lovers and passengers were already lamenting the passing of steam. But as soon as steam trains started being phased out, rumours started circulating of ghost trains spooking London Underground. People reported being able to hear steam trains puffing inexplicably down the tracks at night and being able to smell the coal smoke and see the smoke trails they left behind. Yes...ghost steam trains had become a thing!

SOURCE: *MyLondon*, 26 October 2021

Laboratory under the Alps studies geothermal energy

In Ticino canton, in the heart of the Swiss Alps, a deep underground laboratory is initiating experiments aimed at harnessing the heat of the earth's crust that could prove to be a promising source of renewable energy.

For those who suffer from claustrophobia, it is better to avoid visiting the BedrettoLab. The underground laboratory of the Swiss Federal Institute of Technology, Zurich (EPFZ), one of the two largest in the world, is located in the bowels of the Alps, at the foot of the Nufenen pass, in the small town of Bedretto (TI).

Scientists work at a borehole that has been drilled at a 45° angle

To reach it, you have to walk on foot, in the semi-darkness, 2.5 kilometres down a tunnel with a diameter of 2.7 metres, drilled under 1500 metres of rock, oozing water. The geological environment here most accurately reflects the conditions needed for tapping geothermal energy.

SOURCE: SFES newsletter and translation from *Le Temps*, Switzerland, 29 September 2021

Russian conference in 2022 on history of hardened structures

The Bunker 703 Museum 2 in Moscow is running a conference on the history of hardened protective structures and related topics on 6 February 2022, as a follow-up to a book.

They are seeking speakers about bunkers: fortifications of the 20th century, shelters, command posts, subways, history, technology, unknown archival documents, materials of field surveys, etc.

Bunker 703 museum – tours in English are available

At the moment it is in Russian. If there is sufficient interest by participants who are not Russian speakers they hope to accommodate them. However their resources are limited and this is the first time they are doing this, so expectations should be conservative.

Applications for speakers are accepted until the end of autumn at specialfortificationgoods@gmail.com

Registration for delegates will be available later closer to the event.

SOURCE. Request by the organiser to Sub Brit via social media

Call for bush fire bunkers in Australia will save lives

Political inaction to standardise fire safety bunker installations across Australia will cost lives this summer as red tape and bureaucracy continue to hinder the process in bushfire-prone areas. Fire bunkers in Victoria – the only state to have a formal accreditation system – saved the lives of six people who took shelter in them during the Black Summer bushfires of 2019–20, which killed 33 people across the country.

Accredited bunkers have since become a popular addition for property owners but people outside Victoria face a list of hurdles in the shape of building approvals, council approvals and technical assessments that have made the process of installing one a lengthy headache. Adding to their woes is lukewarm enthusiasm from firefighting authorities – who fear that a bunker's addition to a property will make some people complacent about bushfire preparedness and use it as a first resort.

After 173 people died when the Black Saturday bushfires

ignited across Victoria in 2009 – Australia's worst fires on record for loss of life – the 2009 Victorian Bushfires Royal Commission found that eight of the victims died while using informal bunkers. The shelters included shipping containers, cellars and self-built bunkers.

Recommendations were made to regulate private bushfire shelters and, as there was a lack of technical standards for the structures, the Victorian government engaged the CSIRO and its Country Fire Authority to work towards creating some.

In 2014, the Australian Building Codes Board (ABCB) drew from the CSIRO's work to create a National Construction Code (NCC) against which all bunkers must now be assessed. Victoria has gone a step further by accrediting and pre-approving commercial lines of bunkers to streamline their installation.

SOURCE: *ABC Radio*, Adelaide

Old Maps website closes down

Over the last 10 years Landmark Information Group has partnered with the team at Old Maps to sell our historical mapping data to consumers keen to learn about local history or purchase printed maps for personal or decorative use. Viewing and printing these maps from the Old Maps website was limited under our license agreement to non-commercial users.

Over the past 12 months, it became apparent that some of their professional services users were not clear about these restrictions and were choosing to use Old Maps as a reference tool as an alternative to accessing and purchasing historical maps under commercial license terms.

As a result Landmark has decided to focus their efforts on clarifying and improving their historical mapping offer to the professional services market. Regrettably, this means that they are no longer able to offer consumers access to the Old Maps website.

[Note: Your editor was a paid subscriber to Old Maps and found it a very valuable research facility that will be missed.]

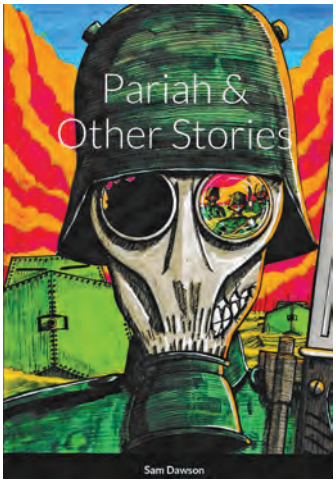
SOURCE: Old Maps website

NEWS – PUBLICATIONS & BOOK REVIEWS

Pariah & Other Stories*, *Supernatural Tales

Dawson, Sam, 2021, 188pp, £5.95

Print-on-demand at www.lulu.com



Book Review by Martin Dixon

It is unusual to review a work of fiction for the pages of *Subterranea* but a volume of supernatural tales is, I think, a first. Sam Dawson is a Sub Brit member, a contributor to *Subterranea* and a regular tour guide at Dorking's South Street Caves. In 2019 he authored *Dorking: A Town Underground* but this latest volume shows that his talents run even deeper.

Pariah & Other Stories is made up of sixteen short stories – averaging about ten pages each but with a couple of tales, including the title piece, running to thirty pages or more. The latter are better described as novellas rather than short stories. The shortest offering is just a couple of pages long and is perhaps more of a tantalising taste of a future longer offering.

The reason that the book is of potential interest to members of Subterranea Britannica is that a number of the stories have subterranean settings. These include a wine cellar, wells, deep-level shelter, a stone quarry and a crypt. Given Sam's extensive underground experience, the description and feel of these locations brings an authentic ring to the tales. The writing is very well researched, and the locations very believable.

Most of the tales start in relative normality and as the plot develops become increasingly sinister and Gothic.

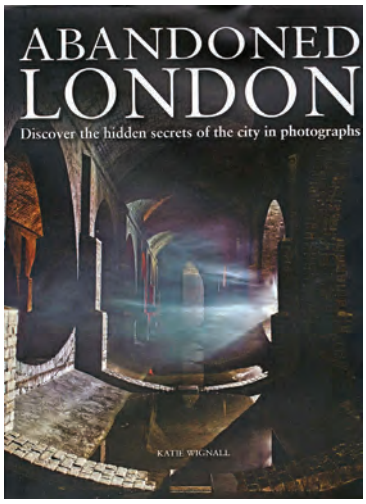
Sometimes the plot develops gradually and the punchline is the culmination of a well-prepared build-up. In other cases the ending is more unexpected and leaves an uncomfortable dissonance in its wake. Sam has also excelled in producing the illustrations that accompany most pieces – fine black and white images that show authentic detail.

I particularly liked some of the descriptive phrases within the book, for example "Blackbirds pour out their liquid song, sounding like the dried-up stream should"; or, in the opening lines of *Pariah* itself: "Inches from his head shrapnel lashed the metal like storm-swept rain stinging the rattling windows of childhood memory." The writing is bang up-to date, with one tale (Self-isolation) taking the Covid pandemic as its starting point.

Although not a genre I have previously read, the compositions are ideal for those who want to dip their toes into something new. Sam brings a new dimension to sites which are familiar to many of us and offers a way of rendering these unlit sites even darker. Perhaps best not read, however, before solo subterranean exploration if you have an imagination prone to fantasy.

Abandoned London

WIGNALL, Katie, 2021, Amber Books , 224pp, £19.99
ISBN: 9781-83886-020-2



Book Review by Martin Dixon

Abandoned London is another 'coffee table' volume which is mildly interesting for a skimmed read but arguably doesn't have the depth of detail or insight to merit too long a look. As its subtitle indicates, it encourages the reader to Discover the hidden secrets of the city in photographs.

The definition of 'abandoned' is quite widely interpreted as the images include Crossness pumping station (surely 'preserved' rather than abandoned), buildings being (and now) restored such as Hammersmith Police Station and the 23-24 Leinster Gardens facade in Bayswater which, of course, has been just a frontage since the Metropolitan line was constructed in the 1860s.

Perhaps ten percent of the photographs comprise sites with an underground connection; these include Finsbury Park Reservoir (which features as the cover image), disused tube stations (Highgate, Down Street, Aldwych and York Road amongst others) , Clapham South deep-level shelter and Crystal Palace subway.

For my money, the main weakness is that the photographs in the book are almost all stock shots from commercial photographic agencies – perhaps eighty percent from Alamy and a handful from Getty and Shutterstock (perhaps their fees are higher?). Fewer than ten photos are credited to the author herself. As a result there is no consistent style or photographic treatment and the volume felt to me like a Google image search with lots of images but little to distinguish one from the other.

Another weakness is that the photographs span many years so although the book is dated 2021, some sites are already long gone. Finally, too many of the images just show a street view, particularly of closed pubs, shops and cinemas and this superficial view is symptomatic of the wider approach.

Katie Wignall is a blue badge London Guide but despite this background, each site merits just a paragraph which doesn't necessarily add a great deal to the knowledge of mankind. For example the closed public toilets in Tottenham proclaim: "In 2017, a UK survey found that 59 percent of women regularly queue to use the toilet, compared with only 11 percent of men. Given differences in anatomy and clothing, the British Toilet Association recommends that the ratio of toilet provision should be at least 2:1 in favour of women." Possibly the photo location ('Opposite Bottom') is as enlightening as the caption itself.

According to her website, Katie charges "from £180 for a two-hour walking tour of London for a couple." Compared to this you could argue the book represents good value but for me it lacks any obvious passion and seems to be mechanistic rather than inspirational. It was, perhaps, overly triggered by the need to find replacement employment during last year's lockdown.

NEWS – TUNNELS AND TUNNELLING

Cost of Silvertown tunnel could be higher than expected

Transport for London has been accused of hiding the

Artist's impression of the Silvertown tunnel

true cost of the controversial Silvertown Tunnel as anger grows over the scheme. In a London Assembly session on 2 November TfL procurement bosses were grilled on the cost of the project, suggesting the publicly-owned body had made the full costs deliberately hard for the public to understand. The total cost was stated as being £2.2 billion.

David Rowe, the head of Silvertown Tunnel sponsorship, shied away from the figure – which is understood to cover the cost of building and operating the tunnel over 25 years. TfL bosses also refused to comment on a reported £10m pay-out to a firm that had been unsuccessful in bidding to run the project. TfL says the "only" direct cost to the public is £174m, including buying land to enable the construction of the tunnel, which is due to be complete in 2026.

SOURCE: *My London,* 2 November 2021

Elon Musk to build 29-mile tunnel under the Las Vegas strip

Billionaire entrepreneur Elon Musk has won approval to build a 29-mile tunnel system underneath the Las Vegas strip. It will allow up to 57,000 passengers to hitch rides in Teslas to and from casinos every hour, as well as to the city's airport and the Raiders football stadium.

The SpaceX founder's Boring Company already operates a smaller version of the 'Vegas Loop' system underneath the Las Vegas Convention Center, which opened earlier this year to lackluster reviews. Instead of futuristic cars zipping people from place to place at high speeds, it features regular Tesla vehicles being driven by humans trundling through a tunnel at just 35mph.

However, a huge city-wide expansion of the tunnels, which was proposed by The Boring Company in December last year, has now been approved by Vegas officials. It will feature 51 stations along the 29-mile network, each of which will need separate permits to be approved before they are developed.

The Boring Company will also have to get a separate franchise agreement approved by the city of Las Vegas before work can begin. The system will be built in phases, with five to 10 stations opening within the first six months of construction. Between 15 to 20 stations will then be added each year until it is finished.

Artist's impression of one of the stations on the Vegas Loop

Once built, Musk's firm expects a five-mile trip from the airport to the convention centre to take about five minutes and cost $10 (£7.25), while a 3.6-mile ride from the centre to Raiders' Allegiant Stadium would take four minutes and cost $6 (£4.35). Unlike the London Underground, for example, the Vegas Loop will be a point-to-point system, so passengers won't have to stop at each station along the way. Instead, they can be picked up and transported directly to where they want to go without having to stop at each resort.

The Boring Company has previously said it will cover the cost of building the tunnels, but wants hotel casinos to pay for the construction of stations. While it has not revealed how much the latest instalment of the project will cost, The Boring Company previously spent $52.5 million building the two one-way, 0.8-mile tunnels and three passenger stations underneath the city's convention centre.

The system, which was first unveiled in April, will ultimately allow up to 4,400 convention attendees per hour to be whisked across the sprawling campus in just under two minutes. On foot, the journey would take approximately 25 minutes.

SOURCE: *MailOnline,* 21 October 2021

Stunt pilot flies plane through 5,000ft-long tunnel at 150mph

A daredevil pilot made history by flying his plane through two tunnels while going at more than 150mph. The nail-biting feat – which set five new world records – had never before been attempted until stunt pilot Dario Costa of Italy flew his specially modified Zivko Edge 540 racing aircraft through the Tunnel Pass system near Istanbul, Turkey on 4 September.

Precision skill was needed as Costa maintained an altitude of less than three feet with solid concrete surrounding his aircraft on all sides as he flew through two tunnels on the Northern Marmara Motorway in Catalca Mevki. Despite a cross-wind, the Red Bull stunt pilot perfectly navigated his plane through the 360-metre tunnel and into a longer second one, which measured 1,160 metres.

The whole stunt took 43.44 seconds to complete, with Costa celebrating with a 360-degree loop and punching his fist in delight after emerging into the open air. He was presented with five Guinness World Record certificates for the longest tunnel flown through with an aeroplane, the first aeroplane flight through a tunnel, the longest flight under a solid obstacle, the first aeroplane flight

through two tunnels and the first aeroplane take-off from a tunnel.

After he touched down, Costa said he was 'very emotional' about his achievement, which was more than a year in the planning and required a team of forty people. He said: "You don't know what to expect. You don't know if it's going to go good. I have never flown in a tunnel in my life. Nobody [has] ever done [it]."

SOURCE: *MailOnline,* 5 September 2021

Sussex man finds network of tunnels and rooms beneath his 500-year-old family home

A man has discovered dozens of underground tunnels and hidden rooms, which he believes were secret passageways used by servants in the 1800s.

Freddy Goodall from Sussex, who works as a property developer, was looking through old photos of his 500-year-old family home. He noticed a doorway in the library, which was added in the 19th century, but he couldn't see the same doorway in the room now. After searching he realised it was hidden behind a bookshelf. Behind one of the books he found a hole that looked into the hidden room.

Underground passage leading to a blocked entrance

He removed the panel and was shocked to find a dark, empty room behind the bookshelf. He also found a ladder leading to another room above, and when he climbs up, he finds a larger room filled with cobwebs, dust and a huge wasp nest. On the far side of the room there were steps which led him to another passageway.

After climbing down the passageway to the basement, he found two more rooms with doors leading to other passages. Noticing another panel on the floor, he lifted it to find a secret passageway leading to underground rooms. In one of the rooms he found an old safe that looked like it had not been touched for years.

He broke the safe open and found books dating back to 1848 filled with information about the house and some letters. He also found old school books and desks used in the 1900s when the property was an educational institution.

He believes they were servant passages that run under the house and were used by servants to get back and forth from their quarters without being noticed.

SOURCE: *MailOnline,* 14 September 2021

Palestinian prisoners dig tunnel to escape from Israeli prison

Israeli officials have admitted a design 'failure' after six Palestinians broke out of prison by crawling through a pre-made tunnel they found under a sink.

Police, the army and agents from Israel's internal security agency Shin Bet have joined the search effort, deploying sniffer dogs, drones, helicopters and checkpoints to create a perimeter around Gilboa Prison. But it is possible the escapees had already returned to the West Bank, a territory occupied by Israel since 1967, while a police spokesman said they might try to reach the Jordanian border roughly nine miles to the east.

Part of the pre-existing tunnel used by the prisoners to make their escape

The prison, located about two miles from the boundary with the occupied West Bank, is one of the highest-security jails in Israel and houses Palestinians convicted or suspected of 'anti-Israeli activities', including deadly attacks. Four of the six men who escaped were serving life sentences. In addition to perimeter checkpoints and sniffer dog forces, security teams have been dispatched on horses to cover as much ground as possible as they track down the fugitives.

It is not yet known how the fugitives managed to dig the tunnel through the concrete and the ground below, as the maximum security prison does not even allow metal cutlery. However the prison has long dealt with extensive and elaborate smuggling operations into its facilities and it is believed the men had help from allies on the outside and communicated through clandestine mobile phones.

All 400 inmates detained at Gilboa over 'security offences' are being relocated in case additional tunnels have been dug beneath the facility.

SOURCE: *MailOnline,* 6 September 2021

First two miles of HS2 tunnel under Chilterns completed

The first two miles of the divisive HS2 project have been completed, according to the firm building the high-speed railway. HS2 Ltd said Florence, the first giant machine launched, has excavated 1.3 miles of tunnel under the Chiltern Hills, while the second, Cecilia, has made 0.9 miles of progress. The pair of tunnel-boring machines are expected to complete twin 10-mile tunnels in around three years.

Aerial view of the entrance to the Chiltern Tunnels at the south portal HS2 compound, in Rickmansworth, Hertfordshire

The 170-metre-long machines work continuously, operating as a self-contained factory cutting through a mixture of chalk and flint. Florence was launched at a site in Buckinghamshire near the M25 motorway in May. She was named by local schoolchildren after Florence Nightingale, the founder of modern nursing who spent many years in the county.

Cecilia, named after Buckinghamshire-born astronomer and astrophysicist Cecilia Payne-Gaposchkin, was launched in July. A total of ten TBMs will be deployed between London and the West Midlands for Phase 1 of the high-speed railway.

Phase 1 of HS2 was due to open in 2026, but in an update to Parliament in 2019, transport secretary Grant Shapps said the opening date would be pushed back to between 2028 and 2031.

SOURCE: *MailOnline,* 4 November 2021

Queensbury railway tunnel near Bradford saved from collapse

Work to stop a disused railway tunnel collapsing has finished at a cost of £7.2m, officials have said. The 1.4-mile Queensbury Tunnel connects Holmfield, Halifax and Queensbury, on the edge of Bradford, beneath the Pennines in West Yorkshire. National Highways said its lining had been strengthened to prevent any more "uncontrolled collapses."

Campaigners want the tunnel to become a traffic-free "greenway" and said the work was a "monumental waste of time."

The Queensbury Tunnel Society (QTS) said the £7m spent on securing the tunnel could have been put towards making it into a cycle route to be used for generations.

Graeme Bickerdike from the society said: "The past three years have been a monumental waste of time for the taxpayer. They came here with the intention of spending £550,000 over three or four months. They are leaving having spent more than £7m over three years, and the condition of the tunnel hasn't improved. They say it has been stabilised, which it probably has, but whether that was necessary is a matter of considerable argument."

A Department for Transport spokesperson said it had considered bringing the tunnel into public use and would publish its findings "in due course". It has paid for the walking and cycling charity Sustrans to carry out a study into potential cycling routes between Bradford, Keighley and Halifax – considering routes which incorporate Queensbury Tunnel and routes which do not.

National Highways Historical Railways Estate Director Richard Marshall said: "We have now concluded our work to keep Queensbury Tunnel safe. Our work included strengthening the tunnel lining and providing a safe passage through areas where the roof has collapsed, securing the tunnel entrance and dealing with the effects of the diversion of Strines Beck into the tunnel." He said engineers had worked in flooded areas of the tunnel, gaining access by boat and raised platforms.

"Our work strengthened the tunnel to prevent further uncontrolled collapses, ensuring that any future plans for the reuse of the structure can be realised."

SOURCE: *BBC News Leeds and West Yorkshire,* 1 October 2021

Plans to reopen Wales' longest tunnel receive major boost

A two-mile-long Victorian tunnel in the Rhondda which is currently under the control of Highways England will be transferred to Welsh ownership, the Secretary of State for Transport has said. Campaigners are hoping to connect communities in the Rhondda and Afan valleys by reopening the 3,443 yard tunnel built in the 1880s as a route for walkers and cyclists.

If it secures enough money to be developed, it will be the longest cycling tunnel in Europe and the second-longest in the world. Speaking in the House of Commons, Rhondda MP Chris Bryant said that the "mines rescue

service is ready to dangle the Secretary of State down a hole" so that he could have a look at the project. The Secretary of State for Transport, Grant Shapps, said that he had "done a bit of research" and it transpires that England's highway body "owns the tunnel at the moment. I would be happy to transfer it to a local group, the Welsh Government or the local council, with money for the purpose," he said.

The Rhondda Tunnel Society was established in 2014 and has more than 850 members, with Welsh actor Michael Sheen among those backing the project. Chris Bryant said he hoped to see Grant Shapps there soon "because, frankly, the harness is ready". If the group are able to reopen the tunnel as a cycle path it would be a major local attraction, which would be good for tourism and jobs in an area of outstanding beauty that unfortunately has terrible financial deprivation.

SOURCE: Nation Cymru, 5 November 2021

An unimplemented 1986 proposal for a new deep limestone mine in Kent

Paul W. SOWAN

The County of Kent has had, as has every English county (including former Middlesex), a mining history in which economically valuable minerals have been worked underground. Kent's numerous 'deneholes' throughout much of the Chalk outcrop are now interpreted as Medieval agricultural chalk mines. And chalk was mined in more extensive 'pillar-and-stall' workings at numerous places in north Kent, extending into parts of what is now Greater London such as Chislehurst (the so-called 'Chislehurst caves').

The last of these newer mines, many of which were below brickfields and yielded chalk for addition to the brickearth or brick-clay feedstock for brick-making, were worked into the 1920s. On a much smaller scale, silver sand was mined in the 19th century at Hollingbourne, and lignite (poor quality coal) from Tertiary beds at shallow depth near Cobham as recently as 1953. Building-stone was quarried underground from the Kentish Rag beds of the Lower Greensand near Maidstone and at Westerham, so far as can be told in the 19th century, and somewhat earlier fullers' earth was mined near the former place.

Kent mining entered upon a greatly enlarged scale in and after 1906 as a result of the discovery in 1890 of deeply buried Coal Measures at a depth of 1,100 feet at Shakespeare Cliff near Dover (at the site of the abandoned 1880s Channel Tunnel trial boring). The so-called 'Dover colliery' shaft reportedly used more coal in its sinking than was ever raised from the seams detected, which were never commercially worked. A 20th century proposal to mine high quality iron ore from Jurassic strata from a less deep level in the Dover shaft was similarly unproductive.

After numerous trial borings and shaft-sinkings throughout east Kent, four producing mines were ultimately developed. Tilmanstone colliery opened in 1906, and was worked for the next 80 years. Snowdown worked from 1908 to 1987, Chislet from 1914 to 1969, and Betteshanger from 1924. Your scribe was fortunate in visiting Chislet once and Betteshanger collieries twice when they were still in production.

In 1986, the year Tilmanstone colliery closed leaving only two deep mines at work, Kent County Council considered, but did not adopt, a proposal to mine Carboniferous Limestone from beds older than, and stratigraphically below the Coal Measures. Kent's demand for roadstone and aggregate for concrete manufacture were then, and still are, largely met from opencast quarries at the Mendip Hills in Somerset. It was proposed that the saving in rail freight costs from this distant source might outweigh the costs of deep mining, even allowing for problems expected from groundwater and coalbed methane.

Limestone of the required quality had been proved in 20 deep boreholes in an area within the Canterbury – Ramsgate – Folkestone triangle, but too deep to be economically winnable below the greater part of the coalfield, where three of the four producing collieries were located. The most favourably located and less deeply buried stone was proved near the Chislet colliery which had unfortunately been closed in 1969 and the shafts backfilled. Deepening the existing Chislet shafts to reach and work the limestone might have been economically viable, had they remained open. The alternative was to drive a long inclined drift, or sloping tunnel, to reach the limestone at depth below Chislet (about four miles east of Canterbury) at a depth of over 1,100 feet. Presumably the cost calculations resulted in this proposal not being taken forward, as no deep limestone mines resulted.

SOURCE: KENT COUNTY COUNCIL, 1986, *Deep-mined limestone in Kent - a potential source of construction aggregate*. Kent County Council: [48] + 16pp.

Underground Windsor

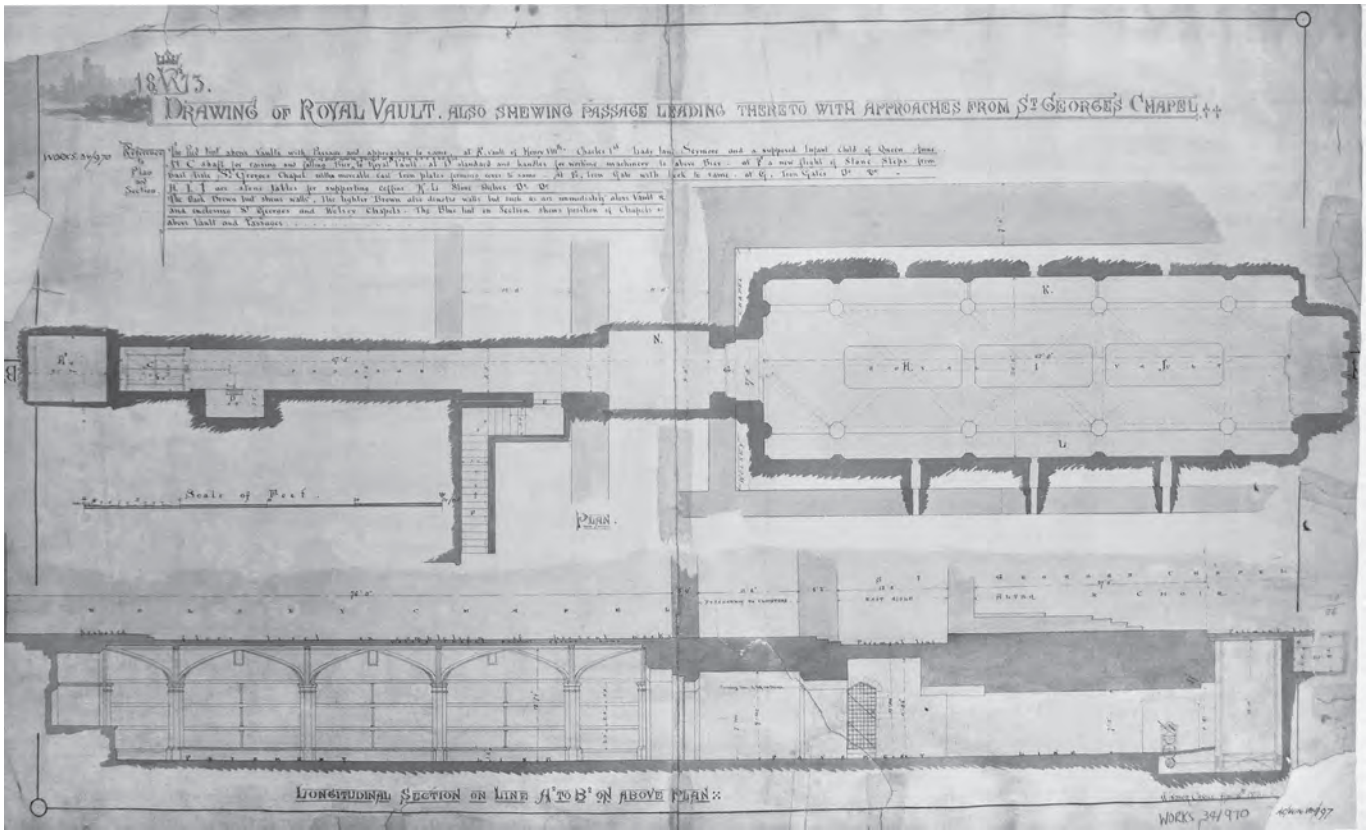
Martin Dixon

The Round Tower of Windsor Castle showing the oversized Royal Standard that is only flown on special occasions. In this case it is the annual Garter Day Service. Photo HM Cotterill, Creative Commons

When the Duke of Edinburgh's funeral took place in April 2021, a TV audience of over thirteen million watched in the UK alone. The final shots showed the Duke's coffin descending on a catafalque beneath the Quire before the coverage cut away, to leave the Royal Family alone in their grief. The image of this final journey underground triggered me to do some research into underground space in Windsor.

Although most locations identified below ground were inaccessible for reasons of security or pandemic restrictions, I managed to assemble quite an assortment of fascinating sites, covering almost 1,000 years of history.

The Duke of Edinburgh's coffin is placed on the catafalque in St George's Chapel. Further into the Quire to the right can be seen the black marble slab that marks the vault containing, amongst others, Henry VIII. © The Sentinel Assam


1873.
DRAWING OF ROYAL VAULT. ALSO SHEWING PASSAGE LEADING THERETO WITH APPROACHES FROM St GEORGE'S CHAPEL
Scale of Feet
PLAN.
LONGITUDINAL SECTION ON LINE A TO B ON ABOVE PLAN.
WORKS 34/970

This plan of the Royal Vault dating from 1873 shows the plan and section of the structure. It is drawn at a scale of one inch to four feet (1:48). The chamber on the extreme left of the plan (right of the section) is the vault containing Henry VIII.
© The National Archives: Work 34/970

Windsor History

Windsor itself originally grew up about two miles south of the current town; its earliest recorded name being *Windlesora*, a name that lives on as the title of the Local History Society's magazine and in the local Wetherspoon pub. Everything changed after the Norman Conquest and around 1070 a motte and bailey (old English for mound and enclosure) castle was built on high ground overlooking the Thames, the motte being an artificial hill, formed of excavations from the dry moat that surrounded it. Initially this settlement was known as New Windsor but at some stage the 'New' was dropped and the earlier settlement became (and still is) Old Windsor.

To get back to Prince Philip's funeral, this took place in St George's Chapel which lies within the 13 acres of Windsor Castle. The origins of the chapel date back to the thirteenth century but the bulk of the current structure was built from 1475 onwards; the rebuilding being largely completed by Henry VIII about 40 years later. The chapel is outside the formal structure of the Church of England and is known as a *Royal Peculiar* as the Dean is responsible directly to the Monarch rather than to a Bishop. The Chapel is also the home of the Order of the Garter, founded in 1348.

Royal Vault

The Royal Vault where the Duke of Edinburgh rests lies beneath what is now known as the Albert Memorial Chapel and was a much later addition to the structure. It was originally created between 1804 and 1810 on the orders of George III who died in 1820. It was only completed in its current form in the reign of Queen Victoria in the 1860s. (Despite the name, Queen Victoria herself and her husband Prince Albert are interred in the Royal Mausoleum in nearby Frogmore. The Royal Mausoleum used to open a couple of times a year but has sadly been closed since 2007 for health and safety reasons.)

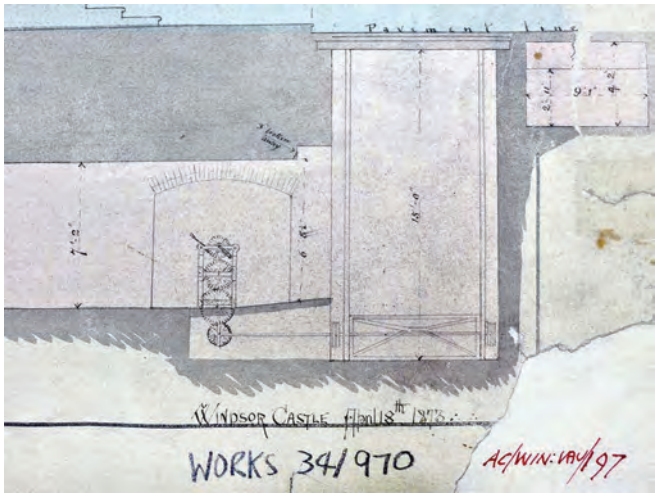
The Royal Vault includes the coffins of over twenty royals, including George III and IV and William IV. Although at the time of writing it holds the coffin of the Duke of Edinburgh, I understand he will eventually be moved to the nearby George VI Memorial Chapel upon the death of Queen Elizabeth II.

St George's Chapel can be visited as part of Windsor Castle (except on Sundays) but the Vault is strictly off limits. Drawings in the National Archive by AY Nutt dated 1873 show the general arrangement of coffins on either side of a central passageway. There is also a detailed plan and section which are drawn above each other, although, interestingly, the plan runs from west to east and the section runs east to west. At the time of the drawings, the Albert Memorial Chapel is referred to as the Wolsey Chapel. The vault measures around 25metres by 7 m. The 1873 plan shows the manual operation for the Catafalque but it was later converted to electric power.

King Henry VIII

A second much smaller vault lies beneath the Quire of the Chapel. Here are buried King Henry VIII, Queen Jane Seymour (his third and favourite wife), King Charles I

This 1873 watercolour by A Y Nutt shows the vaulting and general arrangement of the Royal Crypt.
© The National Archives: Work 34/969



The expanded detail of the Royal Vault section shows the gearing used to lower and raise the catafalque.
© The National Archives: Work 34/970

and an infant child of Queen Anne. Henry was buried in January 1547 alongside Jane and the vault was intended (by Henry at least) to be just a temporary resting place until a much grander tomb had been prepared. But finance and politics intervened and there he remains. The sarcophagus he intended for himself was eventually used for Lord Nelson who is interred in St Paul's Cathedral.

Charles I joined Henry in the same vault on 7 February1649, his burial some distance from London thought by some intended to minimise visits and demonstrations by sympathisers of his cause. Tradition has it that Charles's head was re-attached in the Deanery at Windsor before burial but when the tomb was rediscovered in 1813 (during early work on the Royal Vault) his head was found to be completely detached. The position of Henry VIII's burial and his companions was marked in 1837 by an engraved black marble slab on the orders of William IV.

The last opening of the vault was in 1888 when some relics removed at an earlier date were re-interred. A sketch by Alfred Young Nutt (the Surveyor to the Dean and Canons) shows Henry's coffin in a state of some disrepair. There are various theories as to the cause of this damage. One possibility is that the trestle holding the coffin collapsed; another theory is that the damage was caused during the burial of Charles I.

The most gruesome explanation (proposed by Nutt himself) is that the damage resulted from 'the action of internal forces outward'. This theory is supported by reports that Henry's coffin exploded while resting at Syon House en route to Windsor from Westminster.

This 1888 sketch by A Y Nutt shows the coffins of King Henry VIII (centre), his third wife Jane Seymour (right), and King Charles I with a child of Queen Anne (both left), in the vault under the choir of St George's Chapel.
© The Dean and Canons of Windsor (SGC RBK H.386)

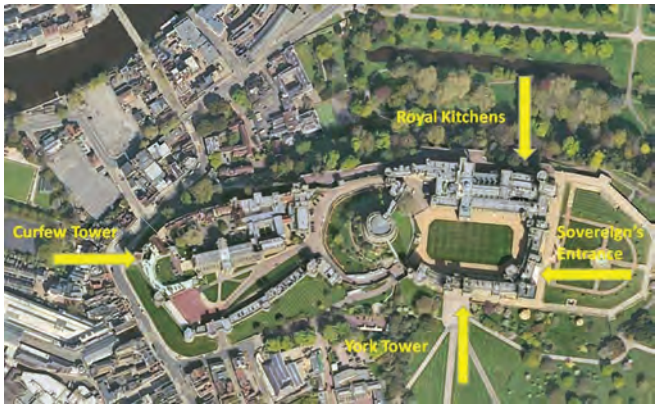
The inscription (dating from 1837) on this understated Regal resting place reads:

IN A VAULT
BENEATH THIS MARBLE SLAB
ARE DEPOSITED THE REMAINS
OF
JANE SEYMOUR QUEEN OF KING HENRY VIII
1537
KING HENRY VIII
1547
KING CHARLES I
1648
AND
AN INFANT CHILD OF QUEEN ANNE

But there is much more of underground interest at Windsor Castle, with some excavations going back hundreds of years.

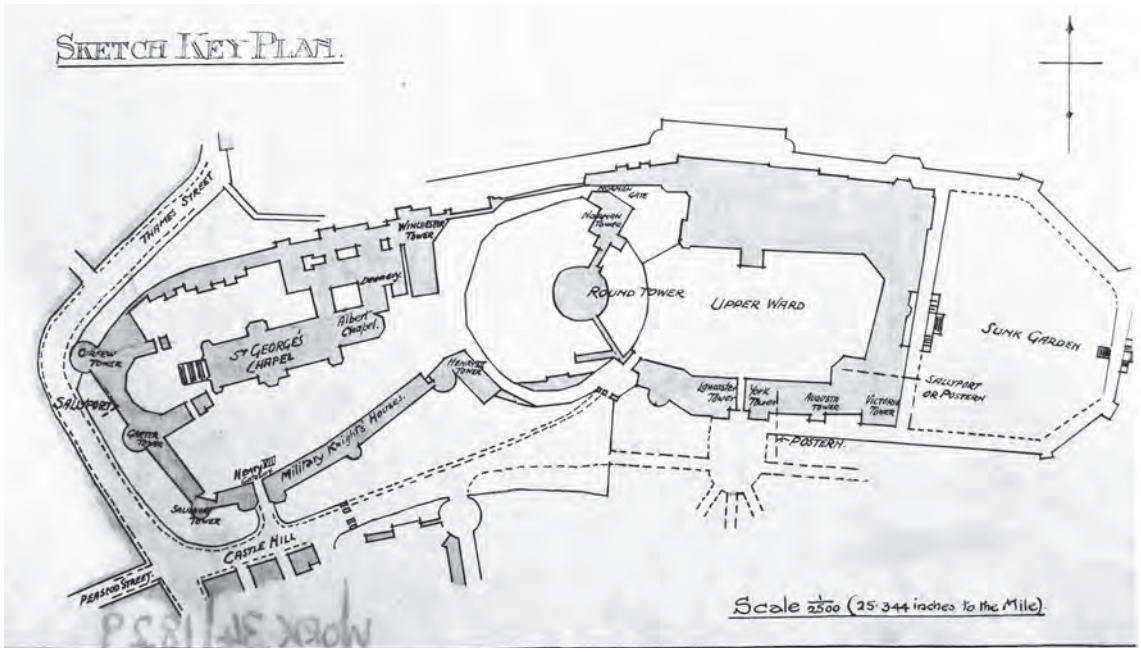
Sally Forth

Firstly, the castle contains the remains of four sally ports which were constructed to allow those inside the castle to exit in secret and attack besieging forces (and to potentially receive supplies while under siege). They are believed to date from 1217 to 1223 when the defences of the castle were strengthened after the unsuccessful siege of 1216 when Louis of France besieged supporters of King John. There were originally four sally ports – one each to the north, south, east and west; two of these still exist and are technically accessible but not to the public.

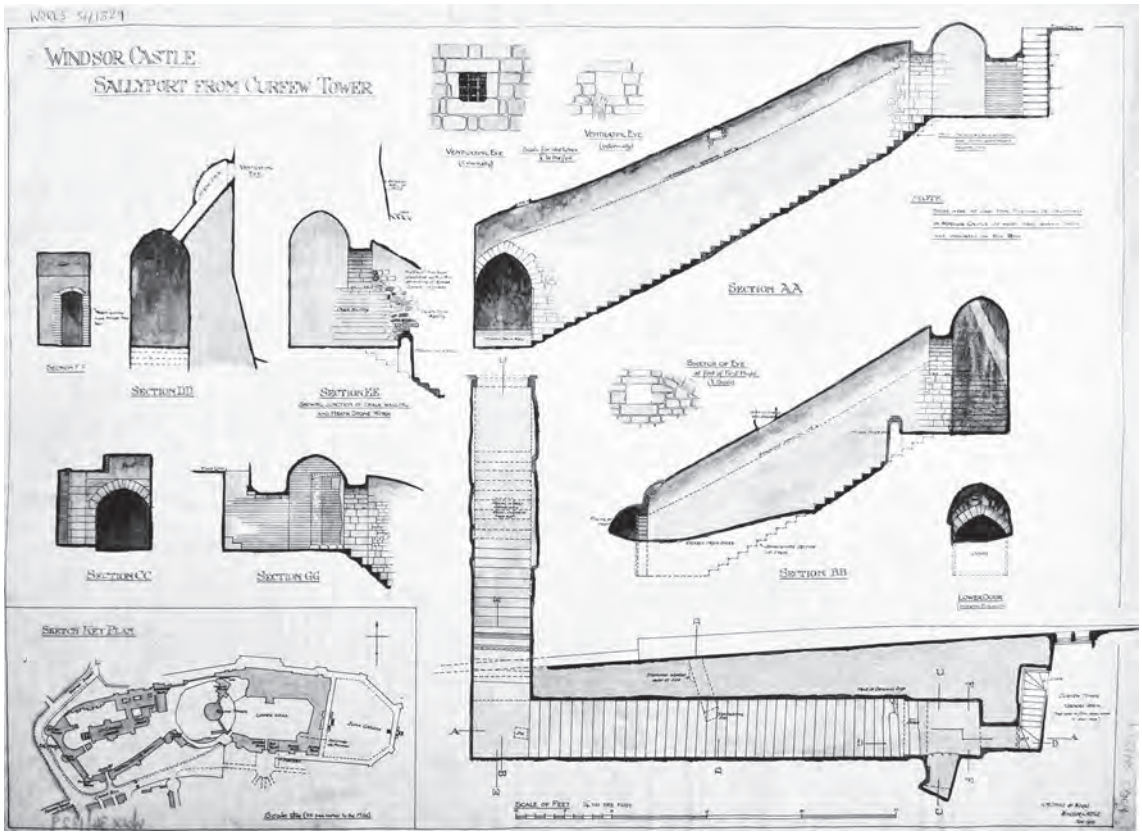


This Google Maps view shows the locations of the four known Sally Ports of Windsor Castle.

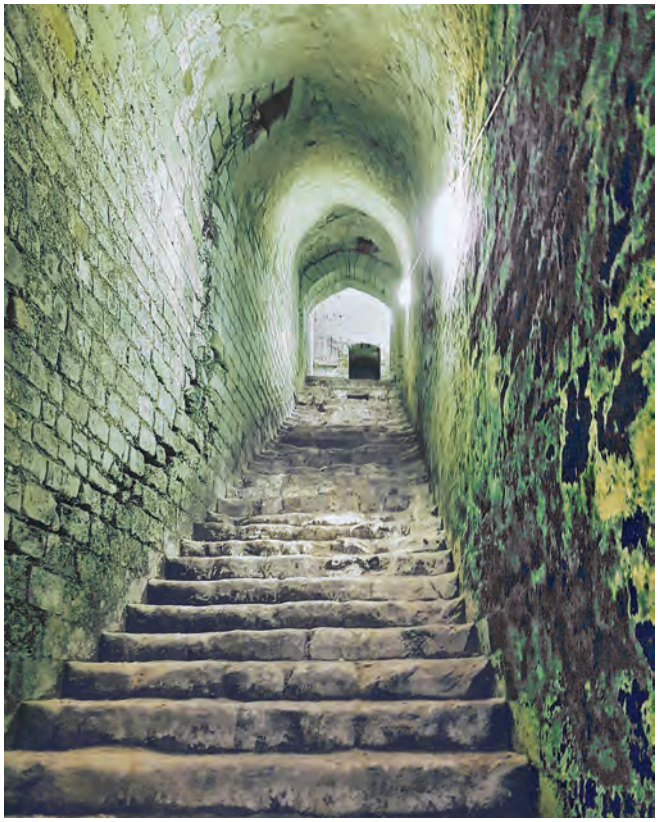
The first sally port runs southeast from just outside the Curfew Tower and then turns at a right angle to pass through the castle walls in a southwesterly direction. It is clearly marked on a plan dated 1919 in the National Archive and it seems the original exit was near what is now McDonald's in Thames Street, perhaps in Curfew Yard, a few metres further south. The moat was partially infilled at some point and the inside of the tunnel now ends in a brick wall.



This detail from the 1919 plan shows the location of three of the four known Sally Ports of Windsor Castle.
© The National Archives
Work 34/1829



This finely executed plan dates from 1919 and shows the Sally Port that leads from Curfew Tower along with several cross-sections.
© The National Archives
Work 34/1829



Looking back up the stairs that form the first section of the Sally Port that leads from the Curfew Tower. Photo Euan Roger

The Ventilating Eye

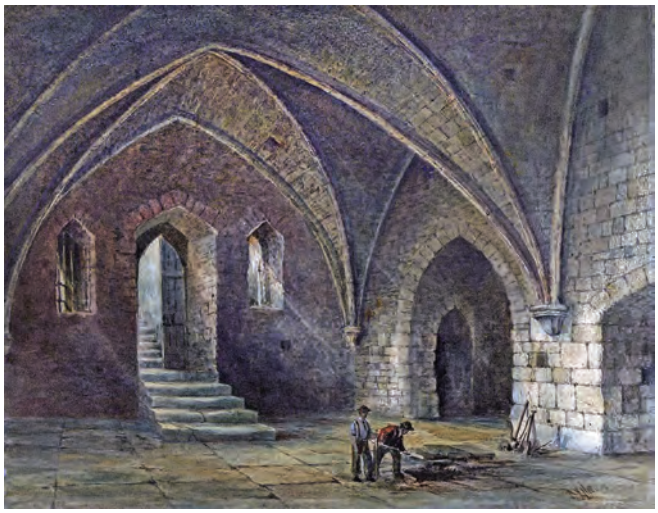
The 1919 plan shows what is described as a 'ventilating eye' in the external wall of the castle, which leads via a narrow flue to the ceiling of the first set of stairs about halfway down. The bottom of the flue is visible as a dark patch in the ceiling in the photograph. I was delighted to find that the external grille over this ventilation passage is still visible from outside the castle. No doubt millions of tourists view it each year with very few realising its significance.

A current photo of the imposing Curfew Tower. The arrow slits of the dungeon can be seen and the dark square in the middle, right of centre, is the ventilating eye . Photo Martin Dixon

The basement of the Curfew Tower itself is still known as the dungeon and as traitors were once hung from the

A close-up comparison of the 1919 sketch and the current view of the ventilating eye in the outside wall of the castle. Photo Martin Dixon

battlements of the tower above this seems a very likely function. Until around ten years ago the dungeon was used annually as the Dungeon Club – a pop-up restaurant for members of the Windsor Festival. Records suggest that the sally port originally started from the dungeon itself although the wisdom of building an emergency exit leading from a jail is questionable! The current access is via a trapdoor in a store room between the Tower and the mews.



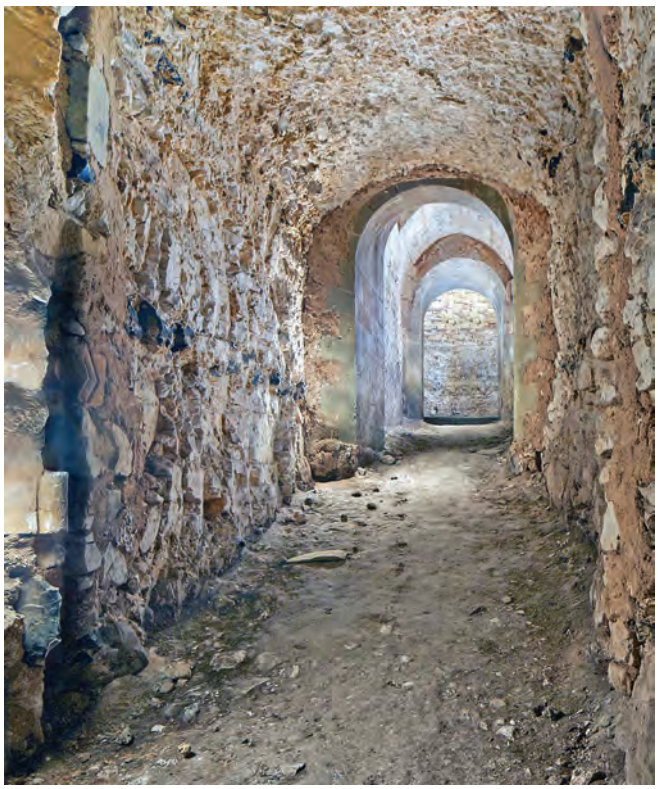
A Victorian watercolour by A Y Nutt of the dungeon in the Curfew Tower, showing the fine vaulting and an intriguing upturned flagstone. Image courtesy of Windsor & Royal Borough Museum

The three other sally ports are located in the Upper Ward and are referred to in some plans as *bowes*, an unusual name, derived from the Latin *bove*, meaning vault. (The same root almost certainly applies to the *Boves* beneath Arras in France which were used in WWI as part of the subterranean access to the front line before the Battle of Arras in 1917.) Some plans also describe them as 'postern gates'. As the Upper Ward includes the private apartments where the Royal Family stay, a request for current plans of these was politely refused so I am relying on other sources for further details.

The Crown Jewels

The second sally port that remains accessible lies just to the west of the York Tower, at the end of the impressive Long Walk which stretches from Windsor Castle to the

'Copper Horse' statue of George III in the Great Park. The access to this tunnel is understood to lead from the fendermakers' room in the basement (the fendermaker is responsible for laying, lighting and fuelling the many fireplaces in the castle).



A recent photograph of the sally port leading from near York Tower, or 'South Bowe'. This would have been the access route to the wartime store for the Crown Jewels. Photo Royal Collection Trust/© Her Majesty Queen Elizabeth II 2021. Photo by Will Pryce

A letter from the then Royal Librarian Sir Owen Morshead to Queen Mary dated 7 January 1941 *(QM/PRIV/CC48/951)* describes how the tunnels were widened and reinforced for the express purpose of storing the Crown Jewels during World War II.

Part of the text reads ... "I didn't tell Your Majesty about the new Strong Room which Their Majesties are having made for the greater safety of the most valuable treasures..... You would have descended through a trap-door in an obscure little room (and) in descending a short ladder for about 12 feet you would have found yourself in a well constructed shaft, inclined at a fairly steep pitch; and down this you would have walked until brought up by its bricked-up end, perhaps 70 or 80 yards down."

He goes on to say that two-thirds of the way along the 'shaft' the tunnel passes through the wall of the castle and would have emerged into the moat that was filled in around 1780. At the end of the tunnel "the Office of Works are tunnelling out two chambers, opening to the right and the left out of the shaft. They will be, say, 12 feet long by 8 feet wide; excavated out of the chalk rock; with 35 feet of head-cover, and their floor, ceilings and walls of thick concrete and steel rails. The whole job will cost about £1200."

The excavation of the two chambers was done via a new six-foot-square shaft, with the chalk spoil being removed by lorries and the spoil heap covered by black tarpaulins by night (though arguably its visibility by day would have been more troublesome). In a final intriguing detail, Sir Owen goes on to say "… at the King's personal wish I did take one bold step. I got down Mr Mann [*Author's Note: of Garrards the Jewellers*], and we took out a dozen of the most important jewels – the Cullinan fragments, the Koh-i-Noor, the Black Prince's ruby; and some few others, to which the Queen added that fat ruby the size of a frog ...

"These stones I wrapped in cotton-wool and placed inside a tall glass preserving-jar with a screw-top & rubber washer, placing in it also a note signed by the King to say that it had been done at his personal direction, and that it was at his wish that nobody had been told. I then packed the glass jar inside a Bath Oliver biscuit tin, which fitted it to perfection; and sealed the top with surgical tape. That tin is at present with the Crown Jewels, which are under my key."

The letter closes with the hope that should invasion occur then these selected jewels could be buried to form the nucleus of a new set of Crown Jewels on our eventual victory.

A Bath Oliver biscuit tin similar to the one that once held the most important of the Crown Jewels in an underground chamber. Photo www.bathnewseum.com

The final two sally ports are no longer accessible. One, leading from near the current Sovereign's Entrance to what is now the East Terrace, is believed to have been used as ventilation for boilers installed by Wyatt around 1830. Finally, there is less clear information about a tunnel leading from what is now the Royal Kitchen, which may have been incorporated into the drains of the kitchen, perhaps as early as the 14th century.

Across what was once a courtyard from the kitchen mentioned above is a large undercroft. This beautifully arched structure was built between 1361–62 and was originally the main beer and wine store for the Castle. Your scribe was privileged to attend a special dinner here

The cafe located in the Undercroft at the castle, opened in 2020. The room was originally the castle's wine cellars and dates back to Edward III's major renovations of the 1350s and 1360s. Photo Royal Collection Trust

in October 2005, to celebrate the 200th anniversary of the Battle of Trafalgar. Since 2020 the undercroft has been used as a cafe for castle visitors.

Windsor ROC Posts

During World War II, Windsor Castle once again took on an active rather than ceremonial military role. One of the highest towers – Brunswick Tower – became an ROC aircraft observation post in August 1943. Use of an existing building wasn't a 'one-off', for example the grandstand at Ascot racecourse (about five miles distant) was also used in the same way.

The ROC Post at Windsor was visited by the King and Queen and Princess Elizabeth on 18 June 1944. Their visit, at the very beginning of the Germans' V1 campaign, certainly put the 'Royal' into the ROC.

The Royal Observer Corps in their basement post beneath the Upper Ward. A Fixed Survey Meter (FSM) and protective cover can just be seen extreme left. Photo Bob Pickwoad

When the ROC was reconstituted in the 1960s as a Cold War unit, Windsor Castle became one of the most unusual posts. The post opened relatively late on in September 1967 and was located in a former coal cellar off a tunnel beneath the Upper Ward. The tunnel was part of a number created by John Robson Turnbull who was Clerk of the Works for Windsor Castle between 1846 and his death in 1866. The main tunnel ran roughly north-south between the State and Private Apartments with a branch off to the east.

As well as providing cellar storage for coal in particular, the tunnels made it easier for staff to move between different parts of the Castle without using public corridors. A commemorative stone in the tunnels is inscribed 'This passage was formed in the 18th year of Queen Victoria's reign, AD 1855.'

The length of the tunnel beneath the Upper Ward, off which the Windsor ROC Post was located, is evident in this shot. Photo Bob Pickwoad

Sub Brit member Bob Pickwoad is a former ROC member and during the late 1970s, while based at Northolt, he visited the Windsor Post. He recalls entering the Upper Ward near the railings to the west and descending into a maze of underground passages.

He recalls, "It was difficult to retain one's orientation with above-ground features but I recall the long tunnels had mirrors at junctions, presumably to stop the collision of scampering servants. The BPI (Bomb Power Indicator) and FSM (Fixed Survey Meter) were positioned at ground level above the post but between exercises the mounts were hidden beneath the lawn in the centre of Upper Ward. To activate the post, a square of turf – universally known as the 'Royal Sod' – was removed and special extension tubes fitted to mount the instruments themselves."

Being completely surrounded by buildings would undoubtedly have affected the accuracy of the BPI and FSM but whether this was ever factored in to calculations is not known. The location of the post meant that, unusually, mains power was available although Bob's memory is hazy about whether a plumbed toilet replaced the usual Elsan.

The GZI (Ground Zero Indicator) was atop the Brunswick Tower itself – itself reached via 50 metres or so of tunnels and passages. Once there, a climb of seven storeys (around 100 feet) lay in store for No 3 Observer when

This recent photograph of the Brunswick Tower gives an impression of the vertical distance to be ascended in order to change the GZI (Ground Zero Indicator) paper. Photo Martin Dixon

the time came to change the photographic paper. For obvious reasons, the target time to change the GZI paper at Windsor was never met! Windsor reported into Number 2 Group Headquarters at Horsham and the post closed in 1991. All traces are reported to have been removed during rebuilding after the castle fire of 1992.

A staged photo of three ROC members examining the GZI (Ground Zero Indicator) mount (but no GZI!) on top of the Brunswick Tower. Photo Bob Pickwoad

Water Water Everywhere ...

The earliest water supply for the settlement at Windsor would no doubt have been the River Thames itself but a well is recorded in the Kitchen Court of Windsor Castle dating from at least the 1360s. It was reported to be around 120 feet deep, with a windlass above. The courtyard was later incorporated into the fabric of the building but the site of the well was revealed during fire restoration work in the 1990s.

Other properties across the town would also have had wells – typically shallower as away from Castle Hill the properties would be much closer to the water table. Many households would have collected water from public wells but some had their own. When Albert Street was built in the 1860s, for example, two adjacent houses shared a single well, each having separate hand pumps in their kitchen/sculleries.

The first piped water supply to the castle was established in the years between 1552 and 1559 and consisted of a conduit system fed from the Blackmoor Stream near Ascot and through Windsor Great Park. There were settling tanks, most likely near the Village in the Great Park, from where trenched lead pipes fed into the castle's upper ward. The last part of the route was substantially uphill but the head of water was still sufficient to feed a fountain reportedly thirteen feet high. The fountain was a grand affair, covered with heraldic beasts including a dragon that had water discharging through its mouth.

The fountain at Trinity College Cambridge which dates from 1601 is contemporary with the one at Windsor and was also conduit-fed. It bears a striking resemblance to that described in the Upper Ward. Photo Andrew Dunn/Creative Commons

The system was very similar to that of Hampton Court Palace, which preceded it by ten years or so and whose former settling tanks can still be viewed at Coombe Conduit House in Coombe Lane, Kingston upon Thames.

The fountain at Trinity College Cambridge which dates from 1601 is very similar to the description of the one at Windsor. The lead for the piping is likely to have been recycled from religious properties destroyed as part of the Reformation; for example Reading Abbey which is comparatively nearby and from where stone was certainly brought and incorporated into the castle improvements.

The Windsor conduit fell into disrepair after around 100 years, most probably due to the silting-up of the pipes from the sandy soil that is commonplace near the water source in the Great Park. At this stage it is probable that the pipes were lifted for recycling once again, meaning that we have to rely on written records to trace the route of the pipeline, although a short section was unearthed in the Parish Churchyard in the 19th century, during the excavation of a grave.

Subsequent water supplies to the Castle relied on a pumped supply, with a water engine installed by Samuel Morland on the Thames at Romney by 1681 capable of

lifting water around 60 feet in height at the rate of '60 barrels per hour'. Around 1850 two reservoirs were built at Cranbourne, a high spot in Windsor Great Park, and fed by pumped water from the Thames. The reservoirs are believed to have been built primarily in order to secure a good water supply in the event of a fire at the castle.

Two circular reservoirs at Cranbourne in Windsor Great Park were built around 1850 to supply the castle with water. Photo A.Fielder The Crown Estate

Around the same time, a piped water supply was first commissioned for the town of Windsor (as opposed to the castle); four hundred houses were supplied by 1849 but many houses relied on wells and pumps until the beginning of the 20th century.

Today's water supply for the town is fed from Thames Water reservoirs at St Leonard's Hill (just a hundred metres or so from the Legoland car park) which was built in the 1960s. Incidentally, a number of hydrant points in the castle's current water mains are still designated with cast-iron *Fire Plug* signs; a term more common across the Atlantic and dating from the days when water mains were made of wood.

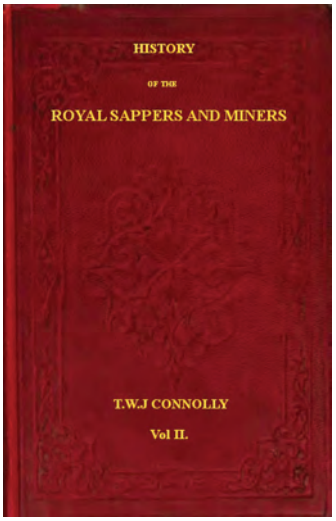
St Leonard's reservoir has a bunker-like entrance at ground level at the mid-point of the eastern face which provides access for monitoring and maintenance. Photo Martin Dixon

A grainy interior photo of St Leonard's Reservoir dating from May 1993 when the structure was presumably undergoing maintenance. Photo The Royal Windsor Website by Thamesweb

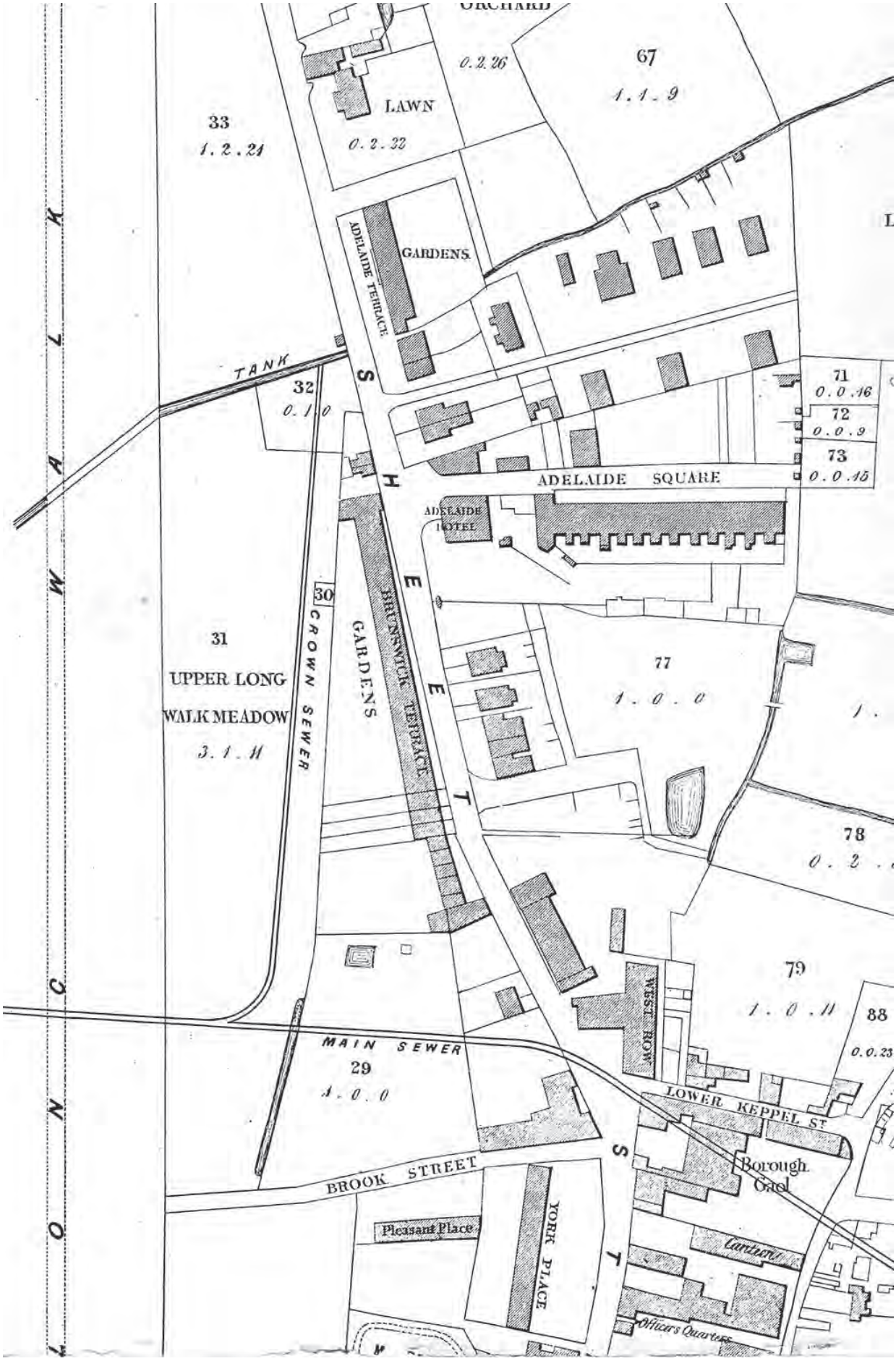
… nor any Drop to Drink

Drainage for much of Windsor relied on cesspits, ditches and streams for disposal until the mid-nineteenth century; the latter two feeding into the Thames, for example at Datchet. Windsor Castle was the first building to have bespoke drainage and in 1846 the Royal Sappers and Miners (later merged with the Royal Engineers) constructed a tunnelled sewer that became the castle's primary sewer.

The following panel is taken from the *History of the Royal Sappers and Miners* by TWJ Connolly, first published in 1855 and digitised in 2017 as part of Project Gutenberg. The text appears rather incongruously between reports of 'Alterations in the dress' and 'Detachment to Hudson's Bay'.



The cover of the History of the Royal Sappers and Miners which describes the history of the Corps from foundation until becoming part of the Royal Engineers in October 1856. Project Gutenberg



This map dated 1860 (unusually, north is down) shows the main sewer (bottom) from the town flowing beneath the Long Walk (left) from where it would reach the River Thames. The Crown Sewer flows in from the south (top) draining the Bourne Ditch. Map courtesy Brigitte Mitchell

Extract from the report of 1846

Corporal John Rae, second-corporal John Mealey and eighteen men were employed from the 8th June to the 17th August, in executing some underground works for the drainage of Windsor. These consisted of a tunnel or cutting from the entrance of the long walk to the north side of the quadrangle of the castle, and also the excavation of a driftway under the north front, moving east and west. The tunnel was approached from several circular shafts 4 feet 6 inches in diameter, of an average depth of about 25 feet; and the gallery—the height of which was six feet, and width 4 feet 6 inches—was driven between 750 and 800 feet through chalk, flint, made earth, old moats, and crumbling vaults and foundations; and, notwithstanding the difficulties of the work, was prosecuted with such exactness, that the line of driving between the shafts was rarely more than an inch or two out of its true level. Indeed, it was remarked that the tunnel, commenced at opposite sides of the castle, was so correct in its progress, that on reaching the centre, there did not exist two inches of difference where the tunnels merged into one.

In hazardous earth, mining frames and sheeting were resorted to, but even these expedients, at times, did not prevent the earth from falling and impeding the workmen. Thirty civil labourers worked the windlasses and drove the barrows for the party. All hands worked from five in the morning until half-past six in the evening, and made by their exertions, seven days and a half a-week, at 1s. 6d. each a-day. Captain Vetch, late of the corps, was the engineer for the work, and Lieutenant the Honourable H. F. Keane commanded the detachment. The Board of Woods and Forests paid the expenses of the undertaking, and praised the skill and energy with which the excavations had been conducted and completed. The Lords Commissioners of Her Majesty's Treasury also acknowledged the great advantage which resulted from the employment of the sappers on the occasion.

Elsewhere in the town, the Cavalry Barracks dating from around 1800 had been joined by the Infantry Barracks. Together these accommodated over 1,000 soldiers and their families; their waste drained into the Bourne Ditch and Town Brook respectively. The Infantry Barracks were connected to a purpose-built sewer in 1850 but the Board of Ordnance refused to pay for a connection to the Cavalry Barracks as 'the Ordnance would derive no advantage from the drain, beyond the taking away of the sewage' [!]

In 1853, the *Windsor and Eton Express* reported that the daughter of a Life Guard at the Cavalry Barracks "fell into the filthy black Bourne Ditch and was pulled out and saved from certain death." In 1858 a soldier fell into the still-open ditch and by 1860 the Bourne Ditch was connected via the 'Crown Sewer' to the town system. The Cavalry Barracks end of the ditch remained an open sewer, however, and by 1872 questions were even asked in Parliament; it was only properly culverted in the 1880s. The course of the ditch can easily be followed on modern maps.

Grottoes

One final water-related underground structure in Windsor Great Park is the grotto that once adjoined the cascade at Virginia Water. The lake is entirely man-made and the dam that created it incorporated a grotto. The dam and grotto were both destroyed by floods in 1768 and Thomas Sandby was tasked with the rebuilding work. Sandby was Deputy Ranger and Architect of the King's Works at Windsor as well as being the Royal Academy's first Professor of Architecture. His first attempt at rebuilding also failed when his new dam was breached in 1782, at which point the popular press christened him "Tommy Sandbank".

A pen and ink and watercolour painting of the Grotto and Cascade at Virginia Water, Windsor Great Park. Drawn by its designer Thomas Sandby (1723–98) in the 1780s. Courtesy Metropolitan Museum of Art (New York) Open Access scheme

The Author pictured at the Virginia Water Lake Cascade as it is today. No obvious sign of the former grotto but an impressive man-made feature that is now over 230 years old. Photo: Linda Dixon

Sandby persevered and the current dam incorporates a cascade, completed in 1789. It is particularly spectacular in winter months following heavy rain. Sandby also recreated the grotto alongside the cascade although sadly this has been blocked off and is no longer accessible. What does survive are some of Sandby's fine sketches and engravings so we can still see the grotto in situ in the eyes of its creator.

Historic England lists two other grottoes in the Grade I listed private grounds of Windsor Castle (Home Park).

These are on the North Slopes, which drop from the castle down to Adelaide Cottage in the park. There are reportedly two flint- and pebble-lined complexes, built by Prince Albert in the 1840s, one of which overlooks a former quarry. Prince Albert used to walk this route most mornings when he was in residence at Windsor.

Ice Houses

Surprisingly, given the importance and age of Windsor Castle, I have been unable to find any published records of an Ice House in the extensive castle grounds and my enquiries have drawn a blank. This despite the fact that the first recorded serving of ice cream in England was in 1671 or 1672, at a banquet celebrating the Feast of St George at Windsor Castle. The banquet was held to celebrate ten years since the restoration of Charles II to the throne.

It's possible that the castle relied heavily on merchants in the town who had their own ice houses; although these too remain in short supply – or wait to be rediscovered. In the garden of number 7 High Street there is, however, a structure which has been identified as a dairy and would no doubt also have needed ice to cool the structure in summer months. It is behind a property that once traded as Buntings dress shop and is on the market at the time of writing. The structure is listed Grade II and described by Historic England as a small picturesque early to mid-19th-century dairy pavilion in the form of Gothicised elongated octagon. Thanks to Alex White for alerting me to the presence of this building and for sharing his own research.

The small Gothic Dairy behind 7 High Street that is an unexpected survival of Windsor's 19th-century townscape. Photo Alex White

There was an Ice House on the Beaumont Estate in Old Windsor, now a conference and event centre run by De Vere. Plans by James Gibb for an ice house to serve Lord Weymouth show a simple structure: a well sunk 12 feet into the ground approached by a trapdoor with a short flight of steps leading down. A timber roof covers the underground section of the building. The drawing suggests several thicknesses of walling.

Unfortunately the exact whereabouts of the structure are unknown, despite extensive enquiries made by Sub Brit founder Sylvia Beamon for her definitive *Ice Houses of Great Britain*. As an aside, the estate originally included the *Bells of Ouzeley* (sometime *Ouseley*) public house, which appears in *Three Men in a Boat* and was rebuilt after being destroyed by a V1 on 16 June 1944. Another ice house (listed at Grade II) remains at 'The Lawn', in nearby Datchet.

Best Cellars

Many properties in the town have cellars and, as in many towns, some are reputed to have led to secret tunnels to the castle and even under the Thames to Eton. Although the cellars are real, and quite extensive under the many pubs in particular, I have uncovered no evidence of tunnels. Adjacent cellars may however have been linked; for example during World War II to provide an alternative emergency exit.

Local guides still tell tour groups that Windsor's *Nell Gwynn Chinese Restaurant* (yes, honestly) was connected by tunnel to the castle, through which Charles II would pass (or, perhaps, vice versa) for secret liaisons. This despite the fact that the house was never occupied by Nell Gwynn and its Historic England listing makes no mention of even a cellar.

When a property next to Windsor's Theatre Royal was being refurbished as the *Giggling Squid* restaurant in 2017, an intriguing and valuable discovery was made. A trapdoor was uncovered leading down to a partially-flooded cellar – remarkably containing cases of vintage wine including Chateau Latour valued at around £20,000. The bottles which were mostly of 1970s vintage were presumed to have been left behind on the closure of an earlier restaurant in the building – although at least two other restaurants occupied the site before the unexpected windfall for the current owners was revealed.

The bottles of wine that were discovered in the cellars of the Giggling Squid restaurant in Thames Street in 2017. Photo Giggling Squid

The nearby Guildhall (designed by Sir Thomas Fitch in 1687 and completed in 1690 after his death) housed both a market and the Town Council. The Berkshire Record Office has a lease dated 21 September 1788 whereby the Mayor, bailiffs and burgesses of New Windsor let "Two vaults built by Nathaniel Meystner under the whole Guildhall extending underground to the Three Tuns" to John Ramsbottom, Richard Ramsbottom and James Baverstock of Windsor, brewers for a period of 14 years for £20 per annum. The *Three Tuns* retained its name (and cellars) until 2018 when it was renamed *The Prince Harry* in an attempt to capitalise on the popularity of the Royal Wedding in the town. The Guildhall cellars went correspondingly downmarket and are now partially used as underground public conveniences.

WINDSOR'S AIR RAID SHELTERS

We give below the complete list of public air raid shelters, communal shelters and school shelters now open in Windsor.

	Accommodation.
1. No. 14 High Street (Butchart's)	30
2. Town Hall, High Street	36
3. No. 49 High Street (Remnant's) ..	30
4. No. 47 High Street (Hills)	25
5. No. 27 High Street (Montague Burton's)	50
6. No. 1 Railway Arch, Goswell Hill (also Communal Shelter No. 127) ..	200
7. Theatre Royal.....	100
8. Playhouse Cinema, Thames Street..	80
9. Playhouse Cinema, Thames Street..	45
10 Farmyard (Playhouse Stokehold)	30
11 No. 126 Peascod Street (Freeman, Hardy & Willis)	50
12 No. 31 Peascod Street (MacFisheries)	65
13 No. 44 Peascod Street (Creak's Furniture Shop)	200
14 No. 76 Peascod Street (David Greig's)	70
15 No. 53 St. Leonard's Road (Wrighton's)	80
16 No. 55 St. Leonard's Road (Pet Store)	65
17 Barry Avenue (near Baths)	53
18 The Goswells (Corporation Yard) ..	50
19 Maidenhead Road (Stovell Recreation Ground)	25
20 Victoria Street, The Acre	50
21 Alma Road (corner of Clarence Road)	25
22 Clarence Road (opposite Imperial Road)	25
23 Dedworth Road (Clewer Recreation Ground)	25
24 Dedworth Road (opposite Refuse Destructor)	25
25 St. Leonard's Road (Hospital Field)	50
26 Frances Road (corner of Fairlight Avenue)	25
27 Sheet Street (opposite Victoria Barracks)	50

Communal Shelters.

101, Behind Clewer Village in grounds of Clewer Park (36); 102 and 103, Behind Swan Terrace, Clewer Village (one 24, one 48); 104, In front Swan Terrace (24); 105 to 108, Charles Street (48 each); 109 to 112, South Place (48); 113 to 116, Edward Square (24); 117 to 120, Grosvenor Place (24); 121 to 124 Denmark Street (24); 125 and 126, The Goswells (48); 127, Railway Arch, No. 1 Goswell Hill (also Public Shelter No. 6 (171); 128, Railway Arch, No. 7 Goswell Hill (171); 129, Railway Arch No. 9 (240); 130 to 133, Alma Road, near G.W.R. Viaduct (East and West) (48); 134, Arthur Road, near Alma Road (48); 135 Arthur Road, next to 121 Arthur Rd. (48); 136, Arthur Road, behind Shelter No. 135 (48); 137, Arthur Road in entry next to No. 145 Arthur Road (48); 138, St. Andrew's Road behind Gardner's Cottages (48); 139, Augusta Place off Oxford Road (96); 140 to 145 Bexley Street (24); 146 to 149, Bexley Street (48); 150 to 155, Albert Street (48); 156 to 162, Elm Road (24).

School Air Raid Shelters.

201 to 211, St. Stephens Schools—Gardners Cottages (32); 212, St. Stephen's Junior School behind School (32); 213 to 215 St. Stephen's, Senior Girls' School, Clewer Fields (40); 216, Trinity School, Alma Road (58); 217 to 222, Royal Free School, Sun Passage (32); 223, Child Welfare Clinic, Charriott's Place (37); 224, Alexandra Road Infants' School (58); 225, St. Edward's R.C. School, Dorset Road (54); 226 to 238 Clarence Road School (32, except one 40); 239 to 242 (Clewer Green School, Hatch Lane (three 32 and one 40); 243 and 44, Spital Infants School (32 and 40).

Note: In the School Shelters three children count as two adults.

The Windsor Express *dated 14 August 1942 included this comprehensive list of local air-raid shelters*

The Ladies Toilets (closed at the time of photographing) that now occupy part of the Guildhall Cellars. In the foreground is an unusual green hexagonal Penfold post box dating from around 1872 (green was the standard colour before red was introduced in 1874). Photo Martin Dixon

Air-Raid shelters

Like almost all built-up areas, Windsor had its share of air-raid shelters, both public and private. The records of the Berkshire County Council: Civil Defence and Emergency Planning Committee record a number of air-raid shelters in arches leased from the Great Western Railway and several in the cellars of shops and in the basement and boiler room of the local cinema (The Windsor Playhouse Cinema). The *Windsor Express* newspaper published a comprehensive list of air-raid shelters, separated between Public, Communal and School.

One of the local schools – at the time known as the Imperial Service College – had a number of purpose-built shelters on its site off Alma Road. The shelters were brick-built with concrete slab roofs and included three that surrounded the Kipling Building. These survived until the early 1980s, when the school was demolished and replaced by the headquarters of Rank Hovis – this now demolished and being redeveloped as office accommodation. As the newspaper extract shows, other schools doubtless had similar provision although interestingly the Imperial Service College shelters don't appear in the list.

The air-raid shelter beside Camperdown House can be seen on the right of this 1960s view from Kipling Building. Photo Roger Cullingham
© The Royal Windsor Website by Thamesweb

The only extant purpose-built shelter I have located is adjacent to the 'Fairground' allotments off St Leonard's Road. It is currently used by the allotment association to store gardening equipment and benches. Eighty-eight

year-old local resident Don Church remembers the shelter during wartime; he sheltered in a similar one a couple of streets away.

Both structures originally had a white **S** (for Shelter) painted in black by the entrance. Don also recalls that tank traps were stored adjacent to the air-raid shelter, ready to be concreted into pre-prepared holes in St Leonard's Road; the Household Cavalry Barracks being about two hundred yards away towards the centre of Windsor.

The only surviving purpose-built air-raid shelter in Windsor? It is situated adjacent to the Fairground allotments. The building to the right is a re-clad US Army World War II hut. Photo Martin Dixon

This detail shows an unusual ventilation grille on the side wall of the air-raid shelter by the Fairground allotments. The text reads 'BROAD & Co LTD, IMPROVED VENTISEAL'. Photo Martin Dixon

Royal Protection

At the castle, existing cellars and basements were used to shelter the Royal Household. In 1950 the former Royal nanny Marion Crawford wrote *The Little Princesses* which, although innocuous by today's standards, caused her to fall out of favour. In the book she recalls, "A bell rang when enemy aircraft were overhead: the signal to go to one of the beetle-infested dungeons.... we seemed to be living in a sort of dimly lit underworld."

The Royal family's initial refuge was under a reinforced basement beneath the Brunswick Tower but they later moved to the Queen's Tower – more convenient for the private apartments – after the walls and roof had been strengthened.

The castle was protected by a number of anti-aircraft batteries, situated in the surrounding open spaces. These numbered three batteries of four heavy (3.7 inch) guns, located at Datchet Common, Dorney Common and Queen Anne's Gate in the Great Park. Closer to the castle were four light anti-aircraft units equipped with Bofors (40mm) guns of which two were sited in the Home Park and the others on the Brocas at Eton and east of Clewer New Town. The nearest Bofors in Home Park had elevation restrictions to prevent the guns shooting the towers off the castle! The National Archives have a map showing these locations (TNA WO 199/286).

WINDSOR CASTLE BOMB SHELTER.

SECRET TUNNEL BUILT BY QUEEN VICTORIA.

ADAPTED AS AIR RAID PRE-CAUTION.

(From a Special Correspondent by Air Mail.)

LONDON, April 9.

To ensure the safety of the Royal Family when in residence at Windsor Castle, in the event of an air raid, it is understood that a secret tunnel is to be re-opened as a bomb and gas proof shelter, to be shared by the servants and staff.

An Air Raid Precautions officer said this week that repairs and necessary alterations to adapt them as shelters are going ahead in the castle vaults. Officials of the Office of Works, however, are disinclined to reveal the full extent of the preparations.

The tunnel, which is stated to have been built at the request of Queen Victoria, winds its way like a maze under the old battlements. In addition to being an impenetrable safeguard against air raids, it provides several ways of escape.

One outlet is at Frogmore, where the Royal Mausoleum is built, in open country close to the Castle. Another tentacle is said to lead direct to the railway station.

This newspaper clipping dated 28 April 1938 describes the measures taken to secure the protection of the Royal Family at Windsor Castle

One curiosity is an article that appeared in the *Cairns Post* on 28 April 1938 (and possibly elsewhere). It speaks of a secret tunnel beneath the castle originally built for Queen Victoria being reopened as a bomb- and gas-proof shelter. It is stated to have secret exits including one near the Frogmore Mausoleum (a distance of around one kilometre) and another leading directly to the railway station.

I suspect that this overstates what was simply the reinforcement of existing cellars and the 'emergency exits' were possibly inspired by the former sally ports.

Alternatively, it is just possible that the Victorian sewers excavated by the Royal Sappers and Miners were intercepted to form an emergency exit (the Long Walk referred to in the contemporary report is adjacent to the Frogmore Mausoleum).

Just east of the Long Walk, there are certainly many bunkers to be seen. Sadly for underground enthusiasts however, I have to report that these are all surface features in the Royal Household Golf Course that lies within Home Park.

The District Line Arrives ...

Windsor residents may look to their neighbours in Maidenhead or Slough with a degree of envy when the Elizabeth Line (Crossrail) finally starts full operation. For it will allow residents of the latter towns to take a train directly beneath the centre of London, without the inconvenience of a change at one of the London termini. But what few realise is that this privilege was available to the good citizens of Windsor for a short period in the 1880s. What is more, the company providing the service was none other than the District Railway; the company name still lives today as the District line – now part of London Underground.

The District Railway's plans at that time included an extension from the station at Ealing towards Uxbridge. When a parliamentary bill for this (with an implied extension to Windsor) was blocked, an alternative approach was taken. The District Railway made an agreement with the Great Western Railway (GWR) that their trains could make use of GWR tracks out of Paddington. Although unusual, the District Line still makes use of track it doesn't own elsewhere on the network. For example the service from Richmond passes over Network Rail tracks until the trains reach Gunnersbury.

The Windsor service, which was announced in February 1883, comprised ten through trains a day from Mansion House to the town, the trains switching onto the GWR line at Ealing. The route took the branch line at Slough (like today's shuttle service) that leads to Windsor station (nowadays known as Windsor & Eton Central).

This announcement of the new direct Windsor service was announced in the Windsor and Eton Express *in February 1883*

... and Departs

The first service ran on 1 March 1883, the journey taking around an hour and a half from Mansion House. With tight connections at Ealing and Slough, the journey today can be done in about the same time. An express service cut the original journey time to around an hour and a quarter. The opportunity to make the through journey was short-lived however, and the service was discontinued on 30 September 1884. The journey into London could still be made on a common ticket by taking the GWR to Ealing and changing there to the District Railway.

But the fleeting visit of the District Railway may not be the last that Windsor sees of railways with an underground element. If the promoters of the Windsor Link Railway get their way, the two Windsor stations – Central and Riverside – will be linked by an underground connection and through services from Slough all the way to Waterloo would operate. Construction of the tunnel is estimated on the scheme's website as taking less than twelve months but given the track record (pun intended) of Crossrail I wouldn't hold your breath!

The imposing entrance canopy to Windsor and Eton Central station was erected to celebrate Queen Victoria's Diamond Jubilee in 1897 and post-dates the District Line's brief foray into the town. Photo Martin Dixon

Services to Windsor and Eton Central station are now reduced to a twice-hourly shuttle from Slough of a maximum of three carriages. Photo Martin Dixon

Acknowledgements

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Grate Expectations

One final cautionary note. Windsor Castle is permanently protected by armed police and a ceremonial guard; any subterranean voids in the immediate surrounds are regularly inspected and protected with tamper-proof security seals. The route taken by the Changing of the Guard troops is particularly well-policed with extensive CCTV coverage. As such, if you are tempted to conduct your own subterranean explorations, do not be surprised to find you have unexpected company!

Manholes and other underground access points in the vicinity of the Castle are regularly inspected and sealed with security strips. Photo Martin Dixon.

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Sub Brit weekend at Sywell – Conference and Visits

Robert Wood

The second Sub Brit party back in the daylight after a trip through Blisworth tunnel. Photo: Clive Penfold

At last! A full weekend of talks and visits. In a welcome relief to the COVID restrictions, the Sywell weekend of 15–17 October 2021, postponed from 2020, gave an excellent opportunity for a proper face-to-face conference and underground visits. It was good to see friends old and new after what seems a lifetime of Zoom.

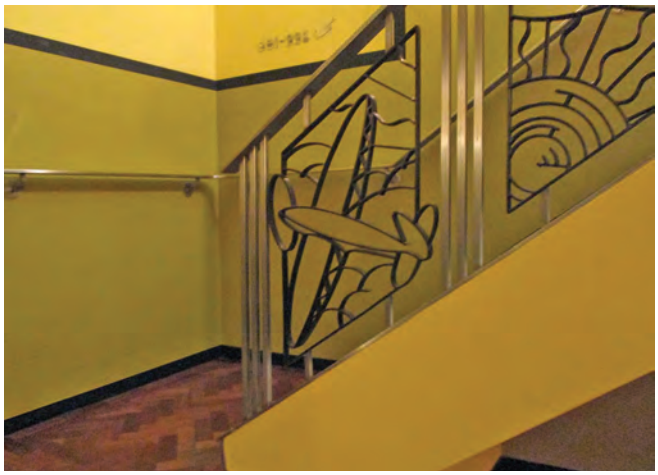
In total, 47 members attended the Friday opening of the Aviation Museum, 63 attended the Saturday conference, 33 came to the dinner, and 46 (a coach full) went on the Sunday visits.

The location chosen as the base for the weekend was the excellent Aviator Hotel at Sywell Aerodrome, just outside Northampton. The aerodrome opened in 1928 for the Northampton Aero Club, and over the years has been home to an RAF flying school and repair depot, an aircraft construction facility (including Lancasters during the war), and commercial flights for passengers and freight. In 2019 Sywell again achieved the AOA (Airport Operators' Association) award for the best general aviation airfield in the UK. Surprisingly, being originally built with grass runways, it only acquired its first concrete runway in 2010!

The magnificent frontage of the Aviator Hotel. Photo: Clive Penfold

The main hotel buildings were originally the Aero Club facilities, later used as flight training rooms, RAF mess rooms, and then as an airport terminal for passenger flights to the Channel Islands – these were run by Dakotas operated by Derby Airways.

Following expansion of the hotel in 1968 with a separate accommodation block, it was fully renovated in 2000 to become the beautiful art deco building it now is. The airfield continues to support many flying-related activities, including training and maintenance, and even boasts a Boeing 737 flight simulator.



Attention to detail in the main staircase

Sywell Aviation Museum – Friday

The museum, which is run entirely by volunteers, was opened specially for us on Friday evening, and again on Saturday as some members had arrived too late for the Friday opening. Although only a relatively small museum, fitted into three connected Nissen huts, it contains some fascinating displays and artefacts. Several members were seen taking good advantage of the many secondhand books and magazines on sale, which of course help with the museum's funding.

The museum entrance

The museum houses a number of aircraft parts retrieved from wartime crash sites, and the displays are very much on the personal level, as many smaller items such as uniforms have been donated from the local area.

There are excellent displays of recreated crew positions, such as radio operator and gunner positions ranging from a Lancaster to a B17, and a number of small recreated wartime rooms such as a wartime kitchen and an airfield armoury. Some cockpits are open for inspection, including a Chipmunk trainer, which visitors can enter if they wish (Tim – I think this is aimed at children!).

A general view of part of the museum interior.
Photo: Clive Penfold

Your chairman gives the thumbs-up after completing the take-off checklist for a Chipmunk – forgetting it didn't include the steps "confirm you have wings and engine attached"

The 1942 Link trainer, with the control desk on the right.
Photo: Clive Penfold

A highlight for me was seeing a splendid Link blind-flying trainer, complete with control desk, dating from 1942. The desk surface was a map, which had a small wheeled pointer to show where the simulated plane was flying.

The cockpit of the trainer

Outside, a small pillbox and a test sphere from a 1950s Blue Danube atomic bomb were on display. This latter item is a dummy representing the explosive part of the bomb (sometimes referred to as the 'physics package'), comprising a number of explosive lenses and a plutonium core. Such examples are sometimes known as 'mules' and were used in handling and bombing trials. The example at the museum was recovered from RAF Elstow in Bedfordshire, a former Royal Ordnance Factory.

Blue Danube MkI test sphere, used in bomb casing ballistic trials

The Conference – Saturday

After several cancellations and postponements, this was to be Sub Brit's first day conference since Reading in October 2019. A varied selection of speakers made for a very interesting day. Thanks to COVID and other unavoidable problems, the organisers were in the unenviable position of having to find replacements for *all* the speakers originally scheduled to attend, including one who unfortunately had to cancel just a few weeks before.

The Ossuary at Rothwell Holy Trinity Church

First up was Mick Coggins with a local theme – the 'Bone Crypt' Ossuary at Rothwell, just a few miles north of Northampton (Rothwell was once the third largest town in Northamptonshire). Construction of the church began in the 12th century, with most of the current features (including the stone crypt and ossuary) completed by the 13th century.

Over the years the church has seen many changes, but remarkably the ossuary has survived – one of only two in the country preserved largely in its original condition. At one time the church was almost cathedral-like, but subsequent rebuilding has reduced its size.

A recent photograph of Rothwell Church. Photo: Toby Rose

The ossuary was designed from the start to have good natural lighting, and contained bones from all parts of the body with larger bones predominating. There are also some animal bones – this is quite common apparently. An ossuary is a Roman Catholic concept, so when the church became Anglican after the Reformation in the 16th century, the ossuary was abandoned and the entrance and windows filled in, only to be rediscovered around 1700 when a gravedigger fell through one of the windows when digging a grave!

Fortunately the collection of bones, containing the remains of about 2,500 individuals, was largely preserved. There have been many other theories, but the consensus is that the contents of the ossuary are the gradual accumulation of skulls and bones removed from the adjacent churchyard, to make space for further burials.

The interior of the ossuary.
Photo: Dr Jennifer Crangle, University of Sheffield

Radiocarbon dating indicates that the majority date from the 1200s to 1400s, with a few later ones dating

from the 1700s to 1800s. Subsequent rearrangements after water ingress in the early 20th century have seen smaller bones re-interred, and the larger ones re-stacked (several times!).

Before the Reformation, the ossuary could have been a stopping point on a pilgrimage and, as evidenced by remains of wall paintings, would have been a local tourist attraction. The ossuary is now open on most Sunday afternoons between April and the end of September, and alternate Sundays off-season.

Maintenance of Minuteman II Missiles in the USA

Our next speaker was Payat Rittler, a volunteer at the Sywell Aviation Museum, who previously worked for the US Air Force as a maintenance technician on the Minuteman II missiles. Payat was based at the missile support base at F E Warren Air Force Base in Cheyenne, Wyoming, one of three similar missile bases in the USA.

These missiles were in use between 1965 and 1994, until superseded by the Minuteman III. With a range of 7,000 miles, the three-stage solid-fuel missiles could be targeted just about anywhere in the world except Australia. The 90th Missile Wing controlled 150 missiles spread over 12,600 square miles, requiring a round trip of several hundred miles to reach some of the missiles for maintenance.

Each missile is housed in a silo at a Launch Facility (LF), which was separate from its Missile Alert Facility (MAF), each MAF controlling ten missiles. Both the LFs and MAFs were largely underground, the LF also having a launcher support building which was hardened, but on the surface.

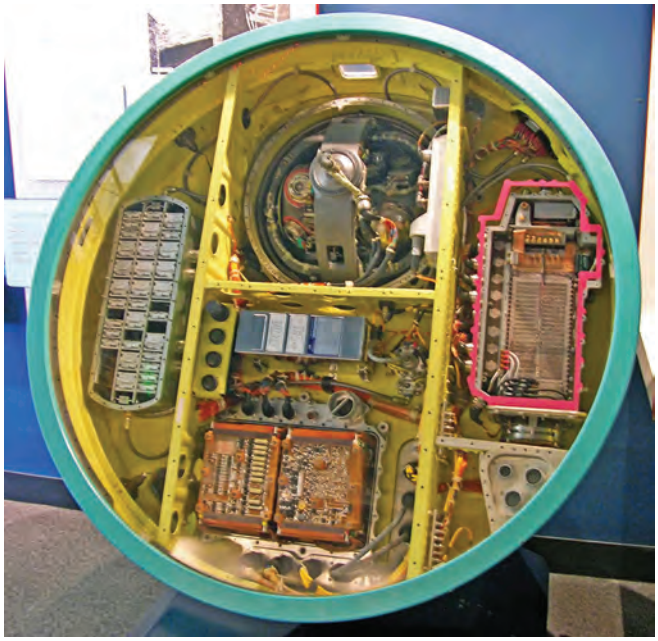
Only the LF combat crew (commander and deputy) were located underground, in peacetime on a 24-hour duty. They had 30 days of rations in case they needed to stay below for an extended period, but these could be probably be stretched to 90 days. The LF crew do not know where their missile is targeted, and can also launch missiles from other Launch Facilities if necessary.

A Minuteman missile in its silo at the Minuteman National Historical Site, South Dakota. Photo: Spencer, GNU Free Documentation License)

Access to the missiles for maintenance was heavily controlled by on-site security staff. Only security staff could open the personnel access door hatch, and a further secondary door located seven feet down a ladder took 45 minutes to open, again to ensure security. A large articulated maintenance truck contained all the necessary equipment and spares for servicing the missile, and would be parked over the access hatch during maintenance.

In order to ensure a quick response, the missile guidance systems (consisting of a guidance computer and inertial guidance platform) were continuously powered up, requiring a cooling system to be operational at all times.

During one maintenance visit, Payat noticed that the cooling system was making a strange noise and appeared about to fail, so was able to shut the missile down before any damage was done. For this action, which saved the USAF over a million dollars in repairs, he received a letter of commendation.



The Minuteman II guidance computer at the National Air and Space Museum, with the inertial guidance system at the top. Photo: Robert Merkel

Payat described one of the sites where the farmer, on whose land the Launch Facility was built, opted to stay in his farmhouse that was fairly close by. The USAF advised him that in the event of a launch, the shockwave would probably break all his windows, but they would of course pay for their replacement. I imagine this would be the least of his problems if World War III had actually started!

The Sally Ports of Windsor Castle

Martin Dixon then gave a short member's presentation on the evidence of sally ports at the castle. These feature in a separate article on underground Windsor elsewhere in this edition, so these notes will be kept brief.

A sally port is a means of exiting or entering a fortified building without being seen by the attackers. At Windsor, there were originally four sally ports, one each on the north, south, east, and west sides, but there are now very

few traces of these, particularly outside the castle.

The Royal Kitchen sally port could have been reused as a drain (or possibly confused with one), but this is not clear; the Sovereign's Entrance sally port was later converted to a ventilation shaft for the boiler house. The York Tower sally port is accessible via a trapdoor, part of it being used during World War II as a strongroom to hold the Crown Jewels.

The sally port with the only visible remains outside the castle is that in the Curfew Tower, which possibly exits opposite McDonalds or a short distance away. In the wall of the tower, however, a 'ventilating eye' is visible as a small rectangular stone-lined hole in the brick wall below the windows, which according to available documentation is the end of a ventilation shaft from this port.

The 'ventilating eye' of the Curfew Tower sally port. Photo: Martin Dixon

Lunchtime entertainment

At lunchtime, an excellent buffet lunch was served, taken at picnic tables overlooking the airfield. Fortunately the sun was shining. While eating and socialising, members were entertained to impromptu flying displays by pilots practising for the World Championship (previously Red Bull) Air Race.

Ludworth Moor Colliery and the last coal miner in Cheshire

Frank Pleszak gave us a most interesting presentation on what is considered to be the last coal mine in Cheshire (now part of Greater Manchester), which was operated by a single miner. It included a lovely (and quite extensive) cine film made on the last day of underground operation on 18 July 1981, for which special lighting had been set up in the mine. We were most privileged to see this film, which had never been seen before outside a small group of friends.

Ludworth Moor in the foothills of the Pennines is on the border with Derbyshire. The Colliery that operated there for almost sixty years from 1927 until 1983 existed in three counties: Derbyshire, then Cheshire, but is now in Greater Manchester.

A narrow outcrop of the Big Smut Coal Seam was exploited by several enterprises with drift mines utilising pillar and stall techniques, the seams being mostly between 8 and 22 inches thick. The miners used simple pickaxes and acetylene torches with naked flames for lighting, as the mine had no methane and was classed as an 'open-flame colliery', and it wasn't until 1969 that the first compressor enabled the use of air picks. Most of the owners failed to make any money.

Alf Gee, who mined Ludworth – often single-handed – until he sold the colliery in 1979 to Rod Thackray and Geoffrey du Feu for £3000. Photo: Geoff Cusick

Alf Gee owned the colliery for almost thirty years, and for twenty of these he worked single-handed deep in the narrow and low tunnels. He purchased redundant Anderson shelters to reinforce the access tunnels – everything was on a limited budget!

In the final years from 1978 to 1981 the mine was operated by Geoffrey du Feu and Rod Thackray, and once the underground coal was exhausted they used opencast techniques with heavy machinery to get the remaining coal out.

Rod Thackray with air pick and acetylene torch, giving a good flavour of working conditions in the narrow seams. Photo: Geoff Cusick

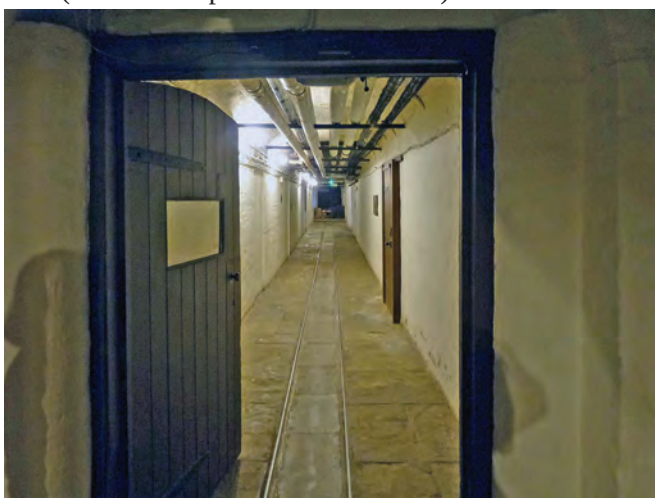
Rod Thackray and Geoffrey du Feu at the mine entrance. The specially cut-down wagon could be lowered directly to the coalface, and was also used for manriding keep your head down! Photo: Geoff Cusick

The colliery finally closed in 1983 when the shafts, adits and opencast diggings were covered and the land returned to upland pasture for cattle and sheep grazing. Today, unless you know the colliery was there, there are hardly any signs of the historic industry that once operated in the area.

The Tatton Hall Tramway Mystery

A short member's presentation by Phil Catling explained his surprise at finding a 40cm-gauge industrial light tramway built into the cellar areas of Tatton Hall, a country house in Cheshire. The Hall is a National Trust property, and parts of the cellar are accessible to visitors.

This 'cellar railway' barely gets a mention on any website (NT or otherwise), and a brief note implies it was used to carry coal, but the single vehicle on display (unfortunately very difficult to photograph) appeared to be for carrying general goods and luggage rather than coal (unless well packed into scuttles).



The single 40cm track in the main cellar corridor. Photo: Jenny Price

The track consists of a single line along the main cellar corridor, with turntables (displaying the maker's name – Decauville) giving access to a side corridor, cold store and an outside door. Phil had seen a hand trolley listed by Decauville, and the example at Tatton seems to be very similar.

There is no evidence that anything other than hand power was used for propulsion. The Hall was refurbished in 1894, and the Decauville 40cm system dates to the 1890s, so this is probably when it was installed. Phil will be writing this up for *Subterranea*, so I'll stop here before I steal his thunder!

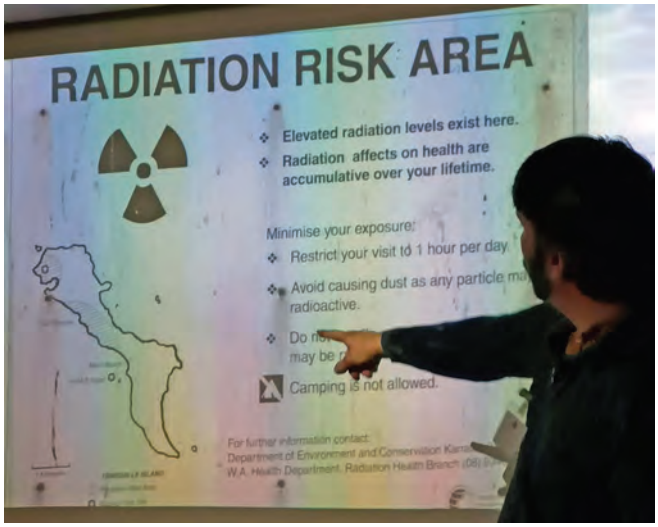
Some discussion ensued regarding any other railway systems of this type in British country houses. A couple of members knew of a rudimentary shoulder-level track in a corridor, with a single trolley, in a section of cellar at Calke Abbey, and also a monorail-type system for transporting food through a cut-and-cover tunnel at Haddon Hall in Derbyshire. Does anyone know of any others? Do please let us know.

Getting under the British Nuclear Tests

Wesley Perriman, who is a member of the Imperial War Museum Specialist Subject Network, next gave a presentation on the British Nuclear Tests, with particular reference to underground features (in keeping with the 'sub' of Sub Brit). Wesley is also Curator of the British Nuclear Test Veterans Association collections and archives. His father was present at a number of the test sites.

The tests were carried out between 1952 and 1963, when a partial test ban treaty was invoked which banned atmospheric tests. Most people have heard of Christmas Island, but tests were also carried out in the Monte Bello Islands, northwest of Australia, and on mainland Australia.

The Monte Bello islands were used for Operation Hurricane in 1952 and Mosaic in 1956. The islands used for the tests and the surrounding area are still radioactive as they were never cleaned up, but can be visited for short periods (this is not well enforced!).


RADIATION RISK AREA
Elevated radiation levels exist here.
Radiation affects on health are accumulative over your lifetime.
Minimise your exposure:
Restrict your visit to 1 hour per day
Camping is not allowed.

Wesley showing the radiation warning sign on one of the Monte Bello Islands used for the tests. Photo: Phil Catling

Operation Totem took place in 1953 in South Australia, followed by Operation Buffalo in 1956 at Maralinga, also on the mainland. Christmas Island in the Pacific Ocean, where the UK carried out nine tests in total, was used by

both the US and UK. On the Australian mainland, the tests were generally low yield, in the range of 8–10 kilotons.

Operation Buffalo also used scale models to simulate larger bomb yields. A major inspection and clean-up operation was carried out on the mainland in 1985, which still found radioactive contamination at the site. The clean-up included burying vehicles and other items, as well as removing some contaminated waste.

Particularly on Christmas Island, very little in the way of underground structures could be built, as it is a coral reef and not very deep. Some steel surface bunkers still exist, but these were just covered in shingle as it was impractical to bury them. About ten years ago some low-level radioactive waste went to landfill on the other side of the world in Middlesbrough, thought to be the site of an old R8 Rotor bunker!

Some sites had Anderson shelters covered in concrete, to see the effect of blast – they were not found to provide any effective protection. In general, more precautions were taken to protect equipment than men. Specialist staff such as doctors or scientists had small 'foxhole' bunkers to shelter in, but others in the open were just told to turn their back on the detonation. The tests were also used to determine the effect on various clothes and uniforms on manikins, and to test a selection of UK Geiger counters.

Wesley with a collection of artefacts relating to the UK tests, including a souvenir jacket and other items collected by his dad. Photo: Phil Catling

Members may find some information about films of nuclear tests of interest. Firstly, you often see what appear to be random white streaks in the sky around mushroom clouds. These are tracer rockets fired in a grid pattern for making measurements of the cloud – a sort of 'graph paper in the sky'.

Secondly – and quite obvious when you think about it – many films of nuclear tests portray a simultaneous flash and bang which is probably what people expect. In practice, at the distance from which the tests were being observed, the shock wave would typically not be felt until at least a minute or two after the flash.

The Calvo Rotor Radar Site

Bob Clary then gave a short member's presentation on the Rotor radar site at Calvo, on the northwest edge of the Lake District in Cumbria. Following a recent visit, he was able to inspect both the main R8 surface bunker and the remote transmitter/receiver sites. The sites are all located near the disused Silloth airfield.

Bob found all that remained of the main surface building was a concrete base, but the remote transmitter and receiver buildings are intact, although the transmitter building is in use by the farmer and now has no evidence of RAF use.

The receiver building still has fence posts around it, and a concrete mast base and other fittings outside. This building hasn't been reused by the farmer, but has been stripped out, with marks on the internal walls showing where equipment was fitted. It is generally considered that this site, although partially fitted out, never entered service.

The Calvo Rotor remote receiver site – note the remaining fence posts and wire in the foreground. Photo: Bob Clary

Evening Entertainment

Some of the members who enjoyed the Saturday evening dinner. Photo: Clive Penfold

Underground Visits – Sunday

Blisworth Canal Tunnel and Stoke Bruerne Canal Museum

Our comfortable coach took us to the Grand Union Canal at Stoke Bruerne. In order to accommodate the number of people on this visit, half took the canal boat through the tunnel northbound from Stoke Bruerne, the others making the trip southbound.

The trip boat Indian Chief *about to embark on its southbound journey into the tunnel*

The canal tunnel at Blisworth on what is now the Grand Union Canal has a long history. Work started shortly after approval for the (then) Grand Junction Canal was granted in 1793. This initial excavation was abandoned three years later after collapses in quicksand which claimed the lives of fourteen men: it seems the chosen route intercepted an underground stream or watercourse. The guide on the northbound trip pointed out the site of this false start to us, just before we entered the tunnel.

It was suggested by William Jessop – the main civil engineer on the project – that a flight of 29 locks could be built to remove the need for a tunnel, but the resident engineer James Barnes maintained that a tunnel was essential. Work started again in 1802 – two years after the rest of the canal had been completed. A new alignment was chosen to avoid the bad ground of the initial attempt.

Until the tunnel's completion in 1805, a double-track tramway was built over Blisworth Hill and the contents of the boats were laboriously unloaded, drawn by horse over the summit and reloaded. Once the tunnel had opened, there being no towpath within, boats had to be laboriously legged through the tunnel.

At each end of the tunnel, small buildings provided some refuge for the leggers. When legging a boat, a long plank was strapped across the front of the boat, and one legger lay on his back each side and 'walked' the boat through the tunnel. An innovative steam-hauled continuous wire rope was installed around 1869, which in turn was replaced by steam tugs which provided haulage between 1871 and 1936.

Reduced traffic and lack of maintenance led to the closure of the tunnel in the 1970s, but a major project led to its re-opening in August 1984. The central section of the tunnel – about a third of its length - was reinforced with cast concrete segments, some aspects of the work being a pilot for the tunnel linings used for the Channel Tunnel. The new tunnel section includes fender pieces at water level on each side, to prevent boats contacting the tunnel wall. The bottom of this new circular section has a false floor two metres below water level, so any boat that sinks will not disappear completely out of sight! An unused segment liner or ring is on display at the southern portal of the tunnel.

The tunnel segment on display outside the entrance. Photo: Clive Penfold

The winding hole (a turning point for boats – pronounced as in "the wind that blows") just south of the tunnel was built in 1970 shortly before the tunnel was closed, so boats arriving at Stoke Bruerne would be able to return south.

Passing an oncoming boat in the repaired tunnel section, clearly showing the concrete segments and the timber-lined fender strip at water level. Photo: Phil Catling

The second Sub Brit party emerging from the southern portal. Photo: Clive Penfold

Today, at 3,076 yards, the tunnel is the third longest canal tunnel in the UK (after Standedge and Dudley). As the tunnel is 15 ft wide it is the longest in the world where craft (narrowboats up to 7 ft wide) can pass at all points within.

The village of Stoke Bruerne, a short distance from the south portal of the tunnel, is at the top of a flight of locks, and has a canal museum run by the Canal and River Trust which includes some exhibits relating to the tunnel. A couple of local operators offer trips through the tunnel from Stoke Bruerne during summer months or by arrangement.

The top lock, as on the rest of the route, was rebuilt as a modern wide lock around 1935, but the original early lock was retained (albeit with new gates) as a gauging lock. This allowed a boat first to be weighed empty, then progressively loaded with weights so the change in freeboard could be determined. When in transit, it was them simply necessary to measure the freeboard to determine the weight of cargo carried, and hence the level of toll to be paid.

Stoke Bruerne Top Lock – the Canal Museum is the building at the far end. Photo: Clive Penfold

Catesby Tunnel Aerodynamic Test Facility

The Great Central Railway (GCR) built Catesby railway tunnel between 1893 and 1897; it lies on the former mainline between Nottingham Victoria and London Marylebone. The GCR built this route to a larger loading gauge than earlier operators, so the tunnel is unusually wide for a double-track tunnel, at 26 ft. The height of the tunnel is around 25 ft and it has a length of around 3,000 yards (2.7km). There is a constant but gentle slope downwards to the north at a gradient of 1 in 176.

The original plan was to have built the line in a cutting throughout but the local landowner (Henry Attenborough) insisted on a tunnel to preserve the landscape and his views. The tunnel is completely straight and nine shafts were used in the construction, five of these being retained for subsequent ventilation.

The contractor was Thomas Oliver of Horsham and the tunnel was bored throughout apart from the northernmost 40 metres where cut-and-cover was used. Steam shovels were used to speed construction, unlike earlier tunnels which relied entirely on human power. The tunnel is lined throughout in local blue bricks.

Catesby Tunnel under construction. The contractor's track is laid into the tunnel. Photo supplied by ARP

A Gresley Class A3 Pacific hauls a passenger service into Catesby Tunnel on 14 May 1949. The loco is still in wartime livery with one of the cab side windows sheeted over. Photo supplied by ARP

The tunnel had an uneventful operational life, closing in September 1966 as part of the Beeching cuts. After the track was lifted, water flooded some of the bed, presumably as the drainage system had been damaged.

In 1997 tentative proposals by Chiltern Railways would have reopened the route through Catesby as far as Rugby or perhaps Leicester but these came to nothing. HS2 also considered the route (a second bore or expanding the existing tunnel would have been needed), but eventually a route some miles to the west was preferred.

The 1897 tunnel portal at the south end of Catesby tunnel, shortly to be linked to the tunnel service building by a covered roadway. Note the temporary ventilation huts either side, also the white tubes that are one-way valves to allow bats out but not in

In 2014, a proposal was made for the conversion of the tunnel into a high speed test track for road vehicles to be known as the Catesby Aerodynamic Research Facility. Planning approval for this was gained in 2017 and since then the developer Aero Research Partners (ARP) has constructed support buildings on the former site of Charwelton Station to the south of the tunnel, which form the beginnings of a Science Park.

The project has attracted a £6.2M investment from the government's local growth fund. By February 2021, a 400-metre road surface had been laid within the tunnel and an opening targeted for later in 2021. At the time of our visit, this roadway was almost complete, and a car has already been driven through the tunnel at 150 mph.

As well as being able to walk the entire length of the tunnel, we were privileged to get a good view of the southern tunnel portal, as a link tunnel from the workshops to the railway tunnel will shortly be blocking off this view.

Inside the tunnel, a lot of hidden work has been carried out on drainage and safety, for instance all the refuges previously used by railway staff have been plated over and backfilled with stone chippings to minimise the effect of a collision (on a vehicle and its occupants – there is no risk of the tunnel structure being compromised).

The vent shafts have been capped where they join the tunnel, and rainwater diverted to drains in the tunnel. Concrete barriers at these locations will shortly have angled steel plates attached, again to minimise the effect of a collision.

Showing how the vent shafts are capped and drained. This example is awaiting its angled steel plates to prevent a collision with the concrete. Photo Clive Penfold

Inside the tunnel – note the plated-over refuge on the right hand side. The white line down the centre is just a centre line – there is no intention to run two-way traffic! Photo Clive Penfold

The tunnel service building, which was handed over by the builders just before our visit, contains two almost identical setting-up workshops, with separate facilities allowing two clients to work in complete confidence if required. These workshops both lead to a single vehicle preparation area.

This includes a combined turntable and weighbridge, mirrored at the far end of the tunnel by another turntable, so cars can be easily turned at each end of the test track (staff and vehicles would not normally exit the north portal, which will be kept closed except in an emergency).

The workshop and preparation areas can accommodate three large trucks. The building also includes offices and a reception area, and the railway cutting has been widened somewhat

Some original railway signs and marks still exist!
Photo: Clive Penfold

Inside the main vehicle preparation area – the tunnel itself is straight ahead from the door at the back.

The vehicle preparation area at the north portal.
Photo: Clive Penfold

to accommodate this building. Temporary ventilation fans are contained in sheds at the south end, soon to be replaced by permanent structures. Similarly, permanent tunnel lighting will be installed in the tunnel to replace the current temporary arrangements.

Although vehicles can be tested in wind tunnels, these are mostly located elsewhere in Europe, incurring extra transport costs. In the future, the tunnel could be used to test some issues under controlled conditions that cannot be tested in a wind tunnel, such as dirt deposition and the effect of surface water.

The test track will be fully instrumented depending on the needs of each customer, and the original platelayers' store rooms built into the sides of the tunnel will be repurposed to contain electrical and instrumentation equipment. ARP manage the Catesby facility, and their sister company TotalSim carries out aerodynamic modelling to complement the testing.

By now, the day was sadly drawing to a close after what was, for most of us, our first Sub Brit trip for two years. We'd heard intriguing presentations, seen fascinatimg sites and reconnected with the great community that makes Sub Brit what it is.

Credits and thanks

In addition to the presenters, I'd like to thank the following people for a real team effort organising the weekend, and helping to make the weekend a success:

* Phil Catling for arranging the speakers and hosting the day meeting
* Adrian Armishaw for recommending sites and host contacts, and opening the aviation museum
* Tony Radstone for booking all the facilities, including coach and boat trips
* Richard Seabrook for setting up the booking system
* Linda Dixon for the logistics of the day meeting, including the excellent refreshments
* Martin and Linda Dixon for co-ordinating and leading the visits
* Alex Cundy of Aero Research Partners for giving us an 'access all areas' visit to Catesby

As this is my first attempt at reporting on a Sub Brit weekend, I would also like to thank Martin for his briefing notes on the two tunnels we visited which made my work much simpler!

Photos by the author unless stated otherwise.

Racks Close Quarry Tunnels, Guildford, Surrey

Nick Catford

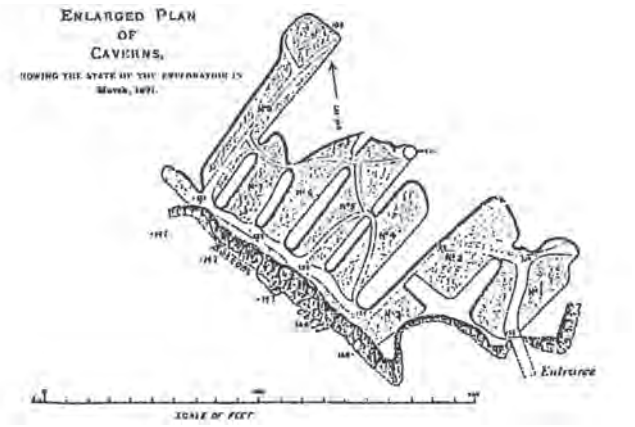
In some places large squared timbers had been put in to support the roof. The wood is now partially rotten and in some places the supports had collapsed as their bases rotted in this view from 2008. Photo Chris Warren

I was recently sent a leaflet handed out to visitors to the 1930 County Show in Stoke Park, Guildford. The leaflet details places of interest in the town that could be visited by taking a bus from the showground to Ram Corner. From there it was a six-minute walk to the Guildford Caves in Quarry Street.

The Friends of Guildford Museum

Eric Morgan described the caves in Issue 14 of the *Friends of Guildford Museum* newsletter, published in July 2002.

> "There are caverns to the south of the Castle grounds and these probably predate the castle. The entrance, now securely closed, is in Racks Close, which is a delightful piece of ground for children to play on. Victorian lecturers could not resist the temptation to describe the caverns as dungeons and torture chambers. They wove ghoulish stories about prisoners being tortured on the rack. Good stories but not true as Racks Close derives its name from the woollen industry which was strong in Guildford and the surrounding area in mediaeval times. The woollen cloth, after it had been dyed blue, was stitched onto hooks on a rack so that it was kept in shape as it dried. The hooks were called tenterhooks or tenterpins and they have given their name to an expression in our language.



Plan of the tunnels in 1871 drawn from the survey made by Captain James of the Royal Engineers. The excavated walkways through the backfilled tunnels are shown

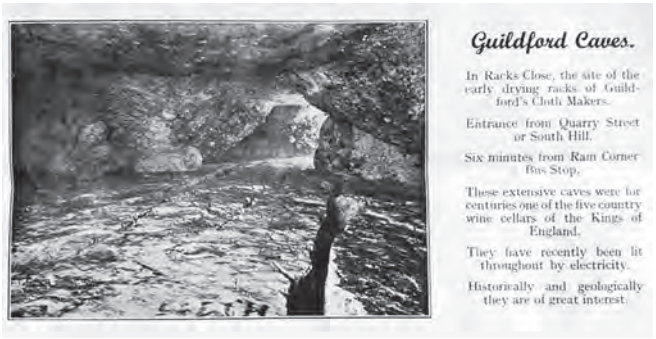
> "But back to our caverns. They are thought to predate the Castle and are man-made. The chalk that was dug out may have been used for building St Mary's

What to see in Guildford To-day. ...
HIGH STREET
The principal shopping centre of West Surrey.
Visit the fine old Guildhall where the Town Plate is on view.
All the places of interest on this folder and many others may be seen by taking a bus to Ram Corner. Buses every few minutes from the Show Ground.

The leaflet handed out to visitors at the 1930 County Show

Church, the Castle and other buildings in the town. Chalk can be soft but sometimes a vein of harder chalk is found which is good for building. In Guildford this vein ran under the Castle grounds and was excavated in mediaeval times or maybe earlier resulting in eight caverns being formed ranging in size from 33 to 105 feet long and about 20 feet wide. The caverns lie parallel with each other and about 10 feet of chalk has been left between the caverns to support the roof. This must have been a major engineering feat at the time, especially as they had no electric light to guide them.

"In the early 1800s Guildford prison was condemned and a new prison built just above the Castle Grounds. The Governor's house, known as South Hall, still stands. Around 1830 the Governor ordered several convicts to dig a well in his garden. He thought that there was no chance of the men escaping because his house and garden were inside the prison walls. A short time later the men were nowhere to be seen. The warders were certain no one had escaped. They went to where the men had been digging and found that their hole had broken through into the caverns below from whence they made their escape. The caverns were then sealed up, although the prison closed a few years later when Wandsworth Gaol opened.


Guildford Caves.
In Racks Close, the site of the early drying racks of Guildford's Cloth Makers.
Entrance from Quarry Street or South Hill.
Six minutes from Ram Corner Bus Stop.
These extensive caves were for centuries one of the five country wine cellars of the Kings of England.
They have recently been lit throughout by electricity.
Historically and geologically they are of great interest.

One of the pages in the leaflet was about the Guildford Caves. Unbelievably the photo of the caves is upside down!

"It was not until 1868, when Captain James of the Royal Engineers was asked by the town council to survey the caverns, that they were entered again. This must have been quite an event. Several workmen gave their services free, and tools were provided by Filmer and Mason's Iron Works. Others stood by with tallow candles and oil lamps. After some time they managed to open up a small hole into one of the caverns and most of the workmen went through. A former Mayor, Mr Upperton, was not going to miss the opportunity to go inside. He was however a man rather fond of his food and consequently rather larger than those who had gone before. Well, he got stuck in the entrance hole and delighted the crowd with his wriggling antics. lt was not until the workmen inside pulled and the crowd outside pushed that Mr Upperton arrived inside.

"If the caverns have been there for hundreds of years what were they used for? There are many references in Royal documents to wine being sent to Guildford Castle, not the odd bottle or two but tuns of it. Indeed a large barrel holding 216 gallons of wine is described as a tun: enough to turn the garrison blotto.

"On the 1st January 1227 thirty tuns of wine arrived at Southampton for the King and three were ordered to be delivered to Guildford. Nine months later a further three were delivered from Southampton and two more brought over from Winchester. Wow, what a party that must have been! Two months later the King had moved to Winchester where supplies must have been low because he sent to Guildford for five tuns of Gascony wine. Twelve years later 15 tuns of wine were sent to the cellars at Guildford Castle. It cost about 36 shillings a cask, plus 7 shillings to transport from Southampton and a further shilling to load and unload. The King had to store it somewhere, so could it have been in the caverns."

Dissenting views

Much of Eric Morgan's colourful description is derived from *The Guildford Caverns*, a booklet about the caves written by local historian Dr G C Williamson in 1930. There has been a lot of debate about the accuracy of Williamson's information, with the suggestion that the book is largely speculation, especially in relation to King John's wine cellars.

1871 OS map clearly shows the tunnels (highlighted in yellow). It is very unusual for large scale OS maps to show underground workings. It is assumed they are shown here as Ordnance Survey were involved in the excavation of the tunnels. See and article in Subterranea 50 by Richard Oliver of the Charles Close Society discussing underground features on late 19th century Ordnance Survey mapping

Local historian Sophie Garratt says: "The wine store is a contentious issue with local historians ─ lots of wine in Guildford had to be stored somewhere. The tunnels at Racks Close do seem a likely place, if indeed they predated or were contemporary to the castle. There is some strong evidence of chambers beneath Castle Cliffe Gardens and this is the most likely location for the wine cellars, as it was actually within the castle walls". I guess we may never know for sure.

Opening the tunnels: sixty years of procrastination

Following the Ordnance survey of the caves initiated by the Town Council in 1868 there were proposals to open the tunnels to the public. The *Surrey Advertiser*, on 1 May 1869, noted: "We are requested to state that the Castle Caverns are not closed as has been reported. Lord Grantley (the land owner) has promised to take an early opportunity of viewing them himself and he will doubtless after that permit their being thrown open to the general public. It need not be supposed for a moment that his Lordship would refuse what would be a great boon to the town and neither a loss or injury to himself.

"His Lordship's brother, the venerable Recorder of the Borough, visited the caverns the other day and expressed great pleasure and wonder in passing through the many passages and rooms which the sun had never penetrated and he spoke most highly of the energy and perseverance shown by Corporal Maidenhead and his men in the last four months. There is an excellent passage now made into the caverns and the caverns themselves are sufficiently cleared out to make a walk through them sufficiently agreeable."

Guildford Caves in the 1930s. This is the photograph that appeared upside down in the 1930 leaflet. Photo from Philip Hutchinson collection

This suggests that the tunnels would soon be open; however protracted arguments about access between Corporal Robert McDonald of the Royal Engineers, who opened up the tunnels and cleared them, and Mr Russell, agent for Lord Grantley, carried on for some time and it is unclear when the tunnels were eventually opened to the public. These arguments are detailed in many lengthy letters published in the *Surrey Advertiser* between July and November 1869.

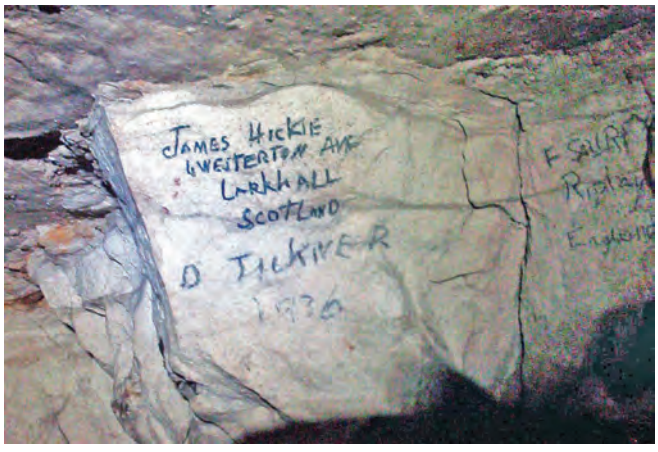
It wasn't until February 1870 that agreement in principle was reached that the Council would adopt the caves for public viewing, subject to obtaining a lease from the landowner and agreeing a yearly rent. The council thought a rent of £5 a year would be appropriate. However by 11 June 1870 there was still no final agreement between the two parties and the *Surrey Advertiser* reported that

the Guildford Caverns are “not yet open”. Dates found in the tunnels during a much later survey suggest that the tunnels may not have been formally opened to the public until around 1930.

Graffiti dating of public access

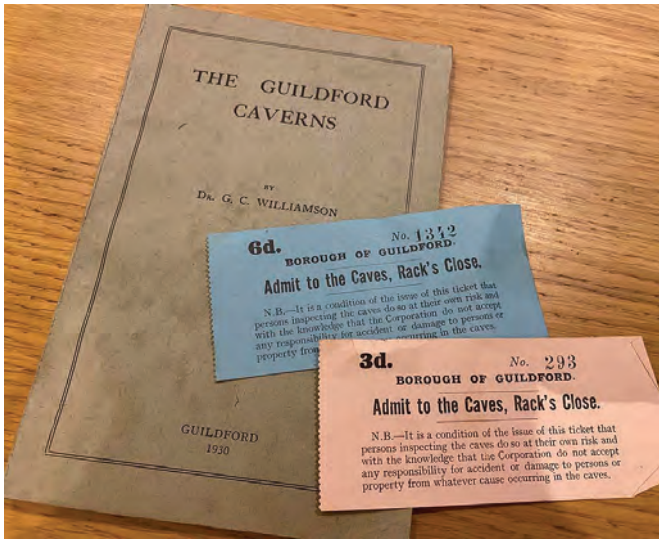
The earliest dates seen are from 1809 with many dates and initials carved into the wall with great care. Other dates noted are from 1818 and 1827, with a few from 1884. When the tunnels were open in 1905 visitors were forbidden from inscribing their names on the tunnel walls but a few from that year have been found. From around 1930, when we know the caves were open to the public with tours on Wednesday and Saturday afternoons, hundreds of inscribed dates are found. At this time it’s known that the caves attracted large numbers of visitors who wrote not just their names but the places that they had come from. These included New York, Germany and Scotland. The small number of dates earlier than 1930 suggests the caves were not opened to the public on a regular basis before then.

The earliest date found is 1809, 1813 is also seen above. Photo Andy Belcher



There are numerous dates from the 1930s when the caves are known to have been open to the public. Here is James Hickie from Scotland and D Tickner in 1936. Photo Andy Belcher

The leaflet handed to visitors at the Surrey show in 1930 states that the tunnels had recently had electric lighting installed throughout. However, despite the influx of visitors, public opening ceased with the outbreak of WWII and the entrance was sealed in the 1950s.

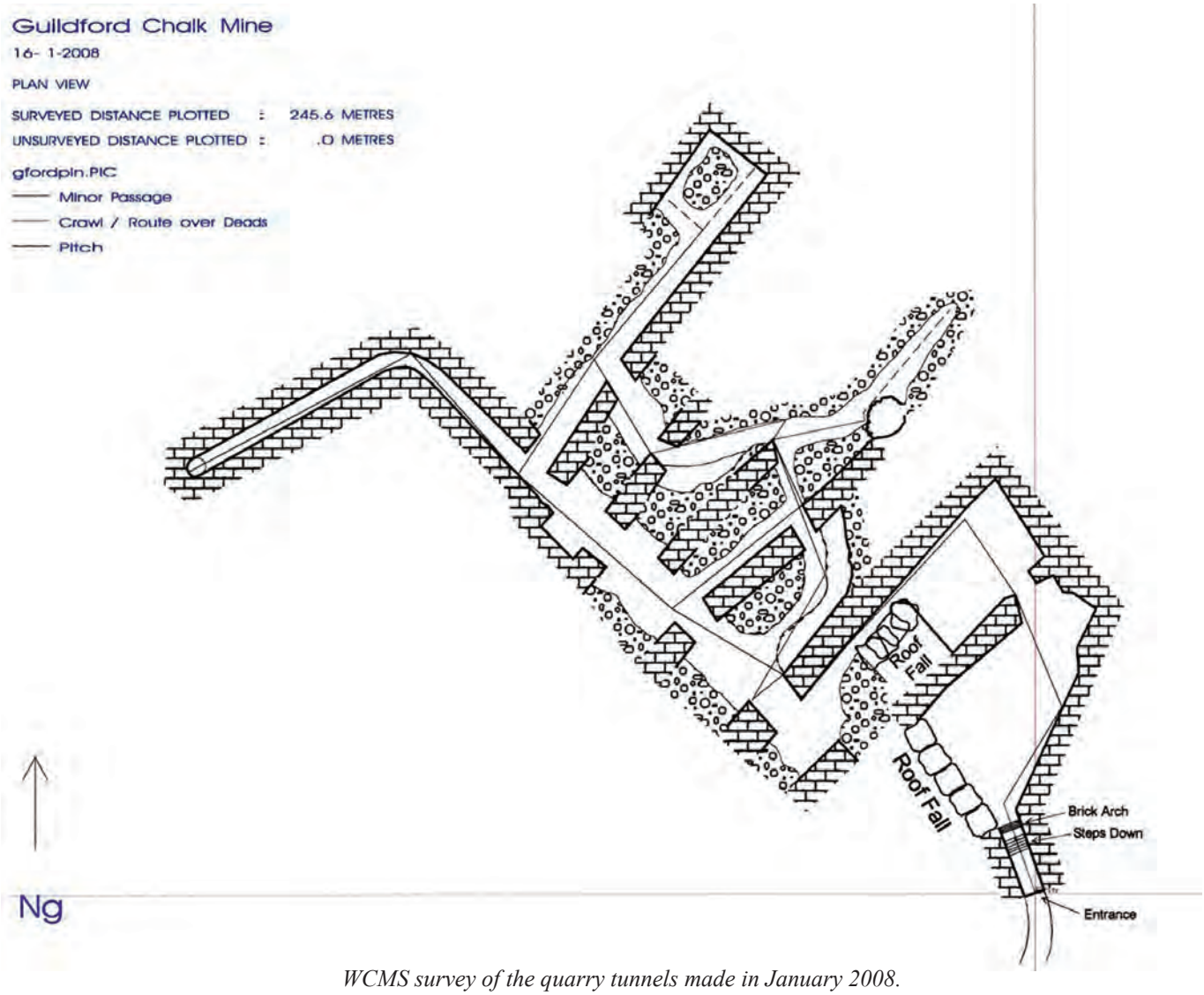

THE GUILDFORD CAVERNS
BY
DR. G. C. WILLIAMSON
GUILDFORD
1930
6d.
No. 1372
BOROUGH OF GUILDFORD.
Admit to the Caves, Rack's Close.
3d.
No. 293
BOROUGH OF GUILDFORD.
Admit to the Caves, Rack's Close.
N.B.—It is a condition of the issue of this ticket that persons inspecting the caves do so at their own risk and with the knowledge that the Corporation do not accept any responsibility for accident or damage to persons or property from whatever cause occurring in the caves.

Tickets for public tours in the 1930s were 6d for adults and 3d for children, and Dr G C Williamson’s booklet published in 1930. Photo Sophie Garrett

A childhood recollection of the tunnels

Geoff Ryan remembers playing in the tunnels as a child in the early 1960s:

> “I lived near Racks Close in Warwicks Bench. I was born there in 1951. When I was growing up we often used to climb the fence that was there and go into the caves, as we called them. Where the concrete steps are now, there used to be wooden ones that led from the house above to an allotment, and was in private hands so it was all very exciting.
>
> “Once down the steps we entered a space and then a larger space that looked like there was no other way. So armed with torches and a bit of courage we climbed what looked like chalk spoil and through the gap near the roof we slid down the other side and found ourselves in a corridor carved out of chalk. It seemed to go a long way and we eventually came to what looked like a well but we were in the bottom of it. There was an old ladder going up to the top, maybe 20—30 feet up. We started to climb the ladder, hoping that maybe we’d find a way out — or more adventure. When we got half-way up, the ladder broke and we tumbled to the floor. No one was badly hurt and it was something to laugh about later.
>
> “We went back numerous times to look for other route and yes, it probably was dangerous, and initially we were nervous of the dark, but we soon got used to it over the years. We discovered that one corridor led towards the river and one towards the castle. It was rumoured that a corridor went to the Angel Hotel but, looking back, I think that unlikely. Anyway just so you know, we all survived and it was eventually sealed up and now you would hardly notice it.”



WCMS survey of the quarry tunnels made in January 2008.

The Wealden Cave and Mine Society survey

In January 2008 the council employed a geological consultancy company to open up and survey the tunnels. The Wealden Cave and Mine Society were invited to survey the tunnels. A contemporary report by Andy Belcher of WCMS describes a visit to the tunnels at that time:

"The site itself is at the end of a narrow cul-de-sac and comprises a small green area, bequeathed to the people of Guildford as a public open space. It was once an old chalk pit with a steep cliff face along the north side and it was beneath this that the quarry tunnels were located. The entrance had been opened with a JCB and then sealed off with a sheet of plywood with plenty of holes in it to vent overnight.

"A short flight of steps led down under a brick arch with an old electrical board on the wall and then into the site proper. Once inside the underground quarry there was a roof-fall where a large section of the roof-bed had levered downwards. But this was a fairly well defined collapse: beyond it the floor was clear and the cavern stretched out, a typical quarry gallery with a flat roof and floor and squared walls.

Racks Quarry floor in January 2008. Contractors have reopened the tunnels prior to a survey being undertaken. The steps give public access to the quarry from Racks Close. Photo Graham Christian

A short flight of steps gave access to the quarry tunnels. The electrical box on the right was for the tunnel lighting installed for the opening of the tunnels to the public in the 1930s. Photo by Philip Hutchinson

Looking up the steps towards the entrance in 2008. Photo Chris Warren

"Like the Surrey firestone quarries, the stone is naturally divided by a series of parallel joints which are aligned roughly northwest to southeast; in fact the overall layout was very similar indeed. Through the second gallery, which was much like the first, a way on to the west could be seen. This too had collapsed but there was an easy route through into the rest of the system. The rest of the site turned out to be in good condition with no other significant falls of stone anywhere except a minor one in the main access passage by gallery No.7. In some places large squared timbers had been put in place. The wood was partially rotten and in most places the supports had collapsed as their bases rotted.

"I carried on through the quarry and made my way across to the far end where I came to a wide shaft leading to a cap about 25–30ft up. The whole site had been filled in at some point, leaving narrow paths cut through which allowed access to pretty much all of the quarry.

"At the far end of gallery No.8 the path reaches the back wall of the chamber and follows it around, making it clear that the gallery was once filled and the paths were

A walkway has been excavated through the backfilled tunnels. Photo Chris Warren

Collapsed and rotted wooden pit props are seen in the foreground. Photo Chris Warren

deliberately re-excavated. At the end of another gallery (no.5) there was an odd structure, rather like a pillar-pack in appearance, made of chalk blocks mortared together. This appeared to be a well shaft sunk through the caverns and subsequently filled in."

A more authoritative assessment

Andy Belcher has also compiled the following, much more reliable, history and description of the quarry:

"The caverns are cut into the Upper Chalk following a bed of hard and fairly pure chalk, extracted as a hard, close-grained stone for internal works such as carvings and ornate surrounds. The chalk follows a thin (1-2cm) bed of clayey chalk which separates the required beds from a more brittle and nodular chalk bed of 2-3ft thickness above. The quarries are superficially very similar to the Surrey firestone quarries in that they are generally 5-6ft high and dipping at about 10 degrees to the north.

"The rock is naturally divided by a series of parallel joints aligned roughly northwest to southeast, typically 4-5ft apart; wide galleries of around 15-20ft have been driven perpendicular to these joints leaving narrow dividing walls of intact stone between them to support the roof. Many of the joints have opened up slightly as fragments of the stone have fallen out, however the overall stability of the site is reasonable except for one span of stone immediately inside the entrance."

Access routes

"The modern (2008) entrance is not the original one that was further west and was buried by a collapse of

The quarry was excavated by pillar and stall with wide galleries and pillars of stone, as seen here, left in place to support the roof. Photo Chris Warren

the cliff above in 1914. The gallery approaching this is solidly backfilled as is much of the site. The fill material is chalk rubble with a considerable amount of brick, tile and pottery fragments. The accessible parts are all routes which have been cut through the fill which, itself, does not quite reach the roof. G C Williamson's account does not explicitly mention this fill, however careful reading of the various contemporary accounts that he includes implies that it was there when the site was re-accessed in 1868, and the paths dug very shortly after."

Electric Lighting & Graffiti

"There is electric cabling for lighting laid throughout the site which appears to date to the late 1930s or 1940s; the fittings are generally very similar to those seen in Carthorse Quarry at Godstone. (*Editor's Note*: the lighting is c.1930). The wiring is laid along the accessible paths and over the top of the fill in places and clearly post-dates it.

"As chalk is such a good material for writing upon or carving, the whole site is liberally covered in graffiti. Most of the dates are from the early 1930s and appear to be restricted to the accessible parts, suggesting that this fill material was already in place by then. The lighting may have been related either to this period of visits or possibly usage during WWII; however there was a distinct lack of graffiti from this latter period, with only one date seen from 1945. Overall the dates make it clear that access has been confined to short periods and the site sealed up for much of the time.

"In the early 20th century the tunnels were used by the Guildford Rifle Club who held a fund raising event there in September 1905. The quarry floor was lit with lanterns and fairy lights and guided tours of the caves were laid on. The *Surrey Advertiser* reported that the event attracted 2,500 people. While the band of the 1st East Surrey Regiment played popular tunes people formed a long queue and waited patiently to enter the caves. The event made a profit of £40 which paid for improvements and an extension to the rifle range.

"In 1917 the site was one of several considered for munitions storage but after an inspection the caves were considered too damp to store explosives. During the 1930s the Guildford Amateur Radio Society used the tunnels to carry out experiments in relation to propagation of radio waves underground. A few dates from 1974 were visible and a time capsule was located from the last known official access in 1984, although there was one date from 1997 where someone appears to have broken in."

Historic Stone Quarrying

"In the late 19th century examination by microscope of samples from surviving buildings were compared to samples from this site and judged to be the same. There seems to be little doubt but that these were stone quarries. Building accounts refer to ashlar supplied from quarries in Guildford for St Paul's Cathedral (1685–90) and there are building account references as far back as 1560, although these do not directly specify this site. Its close association with the castle mound suggests that it may be of medieval date; there are many references to the extensive wine cellars of Henry III, including at Guildford Castle, and to the fact that he frequently resided there. There is no direct proof that these are the same caverns; this is merely presumed from their location and proximity to the castle."

Access Shafts

"There are two shafts into the site. The first is at the northern limit of the site and is a well. The walls are composed of heavily mortared chalk rock, and the well itself has been filled with chalk material from above. Access to these caverns has been obtained at some point from this well as one side has clearly been knocked out and rebuilt.

Well shaft at the north end of the quarry. Prisoners from Guildford prison are said to have escaped through the caves while digging this shaft c1830. Photo Chris Warren

"The other shaft is at the far southwestern extremity of the quarry, this is a wide shaft of 5-6 ft in diameter which is served by a passage cut through the chalk. It is capped above by the remains of brickwork and some steel sheets and has water dripping down. The shaft is quite wide for mere ventilation and the walls are covered in soot. No direct mention of it is made by any of the documentary sources, but is likely that this was dug to regain access."

The Royal Engineers' 1867–68 Survey

In 1867–68 the Ordnance Survey were interested in relocating these caverns and a team of Royal Engineers under Corporal Robert MacDonald (later to become a

This tunnel on the southwest side of the quarry leads to the wide shaft. Photo Chris Warren

popular local philanthropist) was instructed to "*make diligent enquiry*". Access was obtained to the southern chambers (somewhat ambiguous as it could refer either to this shaft or to the current southern entrance); however at a later date access was suspended as "*the owners of the soil above interfered to prevent further exploration, and for a while all such exploration was stopped*". Those present have recorded that nothing was found except "*heaps of chalk debris*".

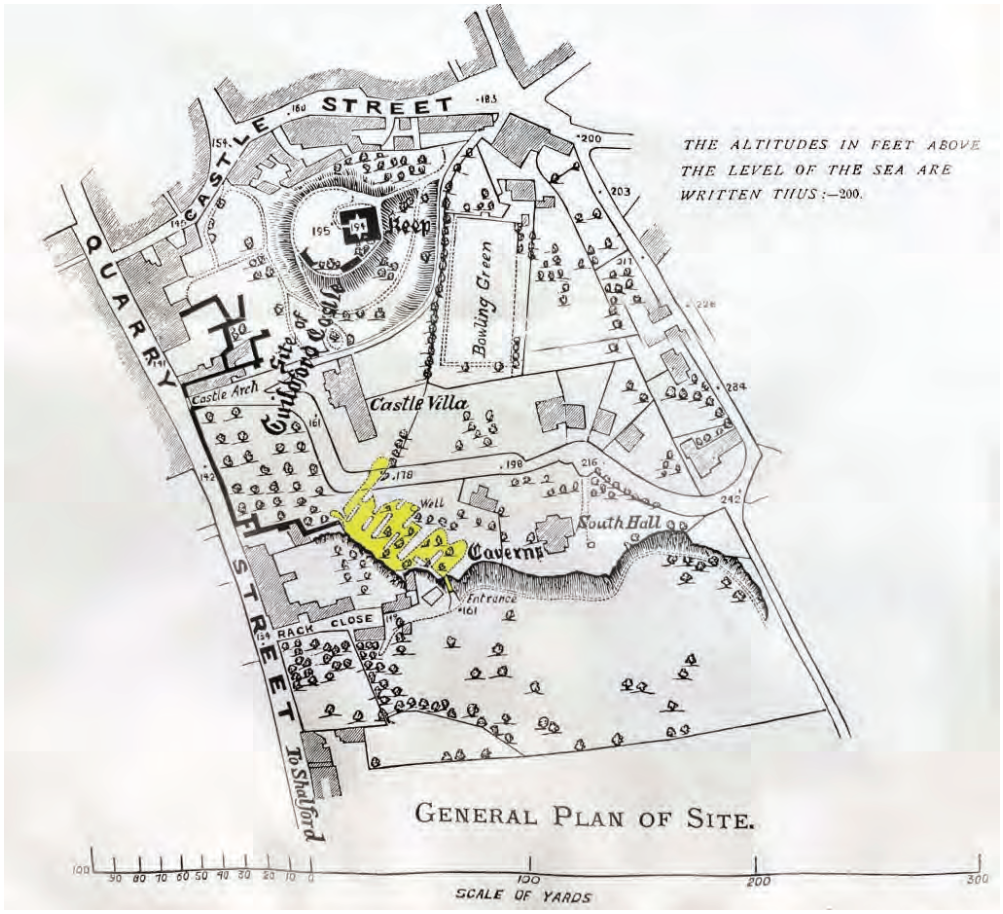
Further works are recorded shortly thereafter by local volunteers under MacDonald, who subsequently explored further and cleared out some of the passages. It would seem likely therefore that much of the infilling material was put there in or around 1830 when the caves were closed following the escape of prisoners.

After the survey in January 2008 a new door was installed. A few trips into the tunnels, mainly for Guildford Museum staff, followed. Photo Philip Hutchinson

Myth-Busting

The possibility that Racks Close tunnels might be part of an extensive network of tunnels beneath Guildford is discussed by buildings archaeologist James Wright and local historian Sophie Garrett in their *Medieval Mythbusting Blog #6: Guildford's Subterranean World,* published in April 2021.

> "First settled in the early mediaeval period, Guildford occupies a strategic position at a narrow gap in the North Downs. The River Wey flows through this gap, and while the initial settlement would have been based near the banks of the river, rapid expansion during the mediaeval period created a compact town centred upon the lower slopes of the North Downs ridge.
>
> "For many years Guildford's online discussion forums have been peppered with threads discussing a myriad of tunnels alleged to lie beneath the town. Most attention is focussed on Guildford Castle which is said to be connected to various landmarks including, but not limited to, the Angel Hotel, King's Head, Royal Oak, NatWest Bank, St Catharine's Chapel and Racks Close Quarry.
>
> "The geology of Guildford is complex ─ the town is spread across bands of chalk, gravel, sandstone and London Clay, along with superficial silt and sand deposits ─ but the majority of the historic centre stands upon solid chalk, and it is this very material which has spawned so many of the myths surrounding the subterranean world of the town.
>
> "In common with many parts of the North Downs, the landscape around Guildford is pitted with chalk quarries. Towering cliffs of white chalk invite the passer-by to consider the fact that our ancestors were prone to excavating this landscape. Meanwhile, the hilly topography and firm bedrock of the town centre invite questions of what may lie beneath.
>
> "True to expectations, there is genuine evidence of underground chalk quarrying on the fringes of the historic town centre. Guildford has an extensive system of mediaeval quarries at Racks Close and there are also later excavations at Foxenden Quarry. (*Editor's note*: These were converted into air-raid shelters during the Second World War ─ see the Sub Brit website.) Comprehensive maps, made in 1871, show the relatively limited extent of the Racks Close quarry tunnels, as well as their footprint beneath the surface, but speculation continues.
>
> "There has been no public access to Racks Close since the Second World War and, since 2008, the entrance has been sealed with concrete and buried beneath undergrowth. However, despite the known history, both of the genuine quarry excavations in the town and a host of entirely imaginary tunnels have been variously explained as relating to escape routes from the castle, passages to assist the movements of



persecuted Catholic priests and the transportation of prisoners, shelters from invading forces, pilgrim tunnels, smugglers' delvings, shortcuts to the local pubs, a quick route for delivery of cordite from Chilworth gunpowder mills (as the river was 'too slow'), easy access to King John's wine cellars, and, most colourfully of all, routes to allow the mistresses of the aristocracy to visit their paramours!

A poor quality postcard showing visitors inside the Guildford Caves in September 1905. The hats epitomise children of the Edwardian period

"The castle has been intimately linked to Racks Close in the popular imagination. However, whilst the castle keep is located relatively near to the tunnel entrance (around 140m as the crow flies), the entrance is located outside the castle walls. There is no evidence of an underground link between the tunnels and the castle grounds. The tunnels themselves are at a datum level over 50 metres below the castle's great tower and they do not even come close to extending beneath it.

"Another common focus of discussion is the historic High Street itself. In the twelfth and thirteenth centuries, the firm clunch chalk from Racks Close quarry was used in the construction of undercrofts or cellars beneath the buildings. As semi-basement spaces, these undercrofts were used as merchants' shops but there is no evidence of these spaces having been interlinked by any form of passageway beneath the street."

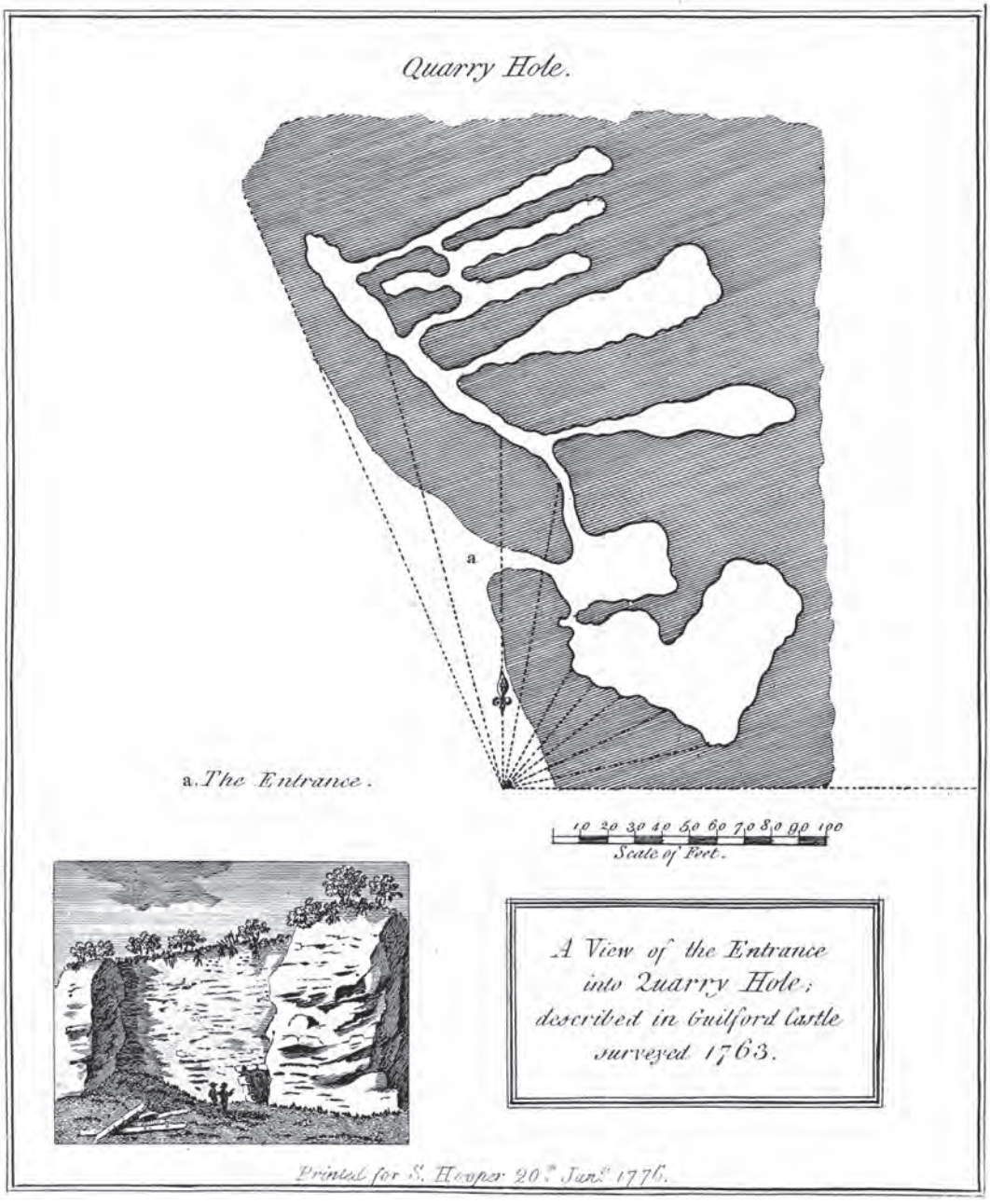
The Quarry Today

The entrance steps have been filled in and the only evidence today are traces of brickwork above the infill. Photo Sophie Garrett

For now the Racks Close tunnels remain sealed and inaccessible with no likelihood of public access at any time in the foreseeable future. The quarry was visited in October 2021 and the entrance steps had been filled in with soil and concrete and the only evidence that an entrance ever existed are a few traces of brickwork above the infill. Access to former quarry floor, which has been a public open space since 1911, is down a modern concrete staircase from the end of Racks Close.

Just as this issue of *Subterranea* was about to go to press this old print turned up on eBay so I bought it. It would appear that the quarry tunnels, described here as Quarry Hole, were accessible and were surveyed in 1763 although no dates that early have been found in the tunnels. The survey roughly resembles the 1871 survey reproduced on page 54 but the entrance is in a completely different place. We know the original entrance was buried following a collapse of the quarry face in 1914.

Entrance to Guildford Caves in the 1930s. There was little difference between the appearance of the entrance seen here and in 2008. Photo DEH Box


Quarry Hole.
a
a. The Entrance.
10 20 30 40 50 60 70 80 90 100
Scale of Feet.
A View of the Entrance into Quarry Hole; described in Guilford Castle surveyed 1763.
Printed for S. Hooper 20th Jan.y 1776.

Object 3001: The Podborsko Nuclear Warhead Bunker

Mieczysław Żuk

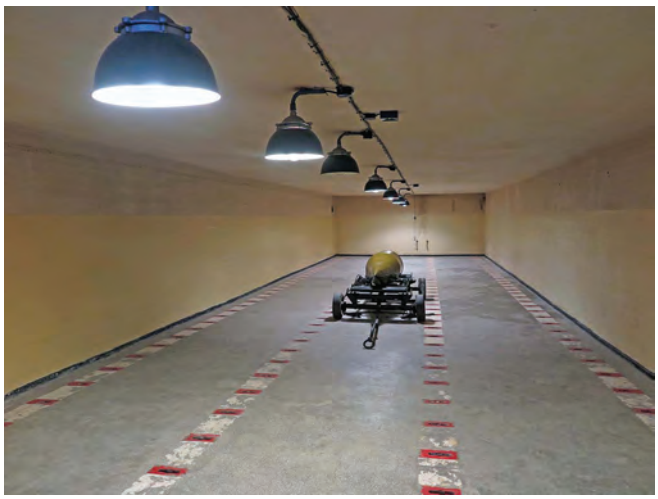
One of the munitions entrances located at either end of a T-7 nuclear warhead bunker, with its massive outer blast door. Photo Dave Maguire

During a recent Sub Brit friends' trip to Poland, we were privileged to be given a private tour of Object 3001, a restored Soviet nuclear warhead bunker, now operated as Podborsko Cold War Museum. Across the whole of the Warsaw Pact there were only 12 such highly secret and protected facilities. David Maguire asked our expert guide, Mieczysław Żuk, to write this account of the bunker for *Subterranea*, which he was happy to do. It came with the invitation: "*I invite you to the Cold War Museum in Podborsko!*"

Tactical deployment of nuclear weapons

The second half of the 1960s saw significant development in the production of nuclear weapons in the Soviet Union. Technological progress made it possible to build nuclear ammunition for tactical (short-range) use, ie direct support of the attacking troops with missiles, artillery and fighter-bombers.

In order to locate tactical nuclear weapons as close as



A tactical nuclear weapons store emptied of all but one of its normal complement of warheads: a sight very few people would have seen - or wished to have seen - during the Cold War. Photo Clive Penfold

Part of the Museum's model of the nuclear warhead base showing one of the T-7 bunkers in the background, but also indicative of the extensive security fencing and camouflage deployed. Photo Tim Wellburn

possible to the future front line - which would lie in the countries on the western border of the Warsaw Pact - the Russians decided to establish new secure bases in these countries. Here, tactical nuclear warheads would be stored and serviced in purpose-built warehouse bunkers supported by all the necessary elements of a self-contained base: barracks and other housing plus logistical, service and other support buildings.

Agreements were signed with the Warsaw Pact countries in which the sites were to be located, the latter undertaking to finance and build them in places selected by the Russians.

In total, twelve bases were built, as follows, each equipped with two T-7 bunkers:

East Germany: (x 2) - Lychen and Stolzenhain (both previously visited by Sub Brit)

Czechoslovakia: (x 3) - Javory 51, 52 and 53

Hungary: (x 1) - Totvazsony

Bulgaria: (x 3)

Poland: (x 3) - Podborsko (3001), Brzeźnica-Kolonia (3002), and Templewo (3003)

The construction and layout of Object 3001

The contract with Poland was signed on February 25, 1967. The construction of the three Polish facilities was carried out in parallel. Object 3001 was built by the Gdynia Engineering and Construction Regiment under the command of Col S Kokodyniak in the period from June 1967 to August 1969. The facility was handed over to the Russians in December of that year.

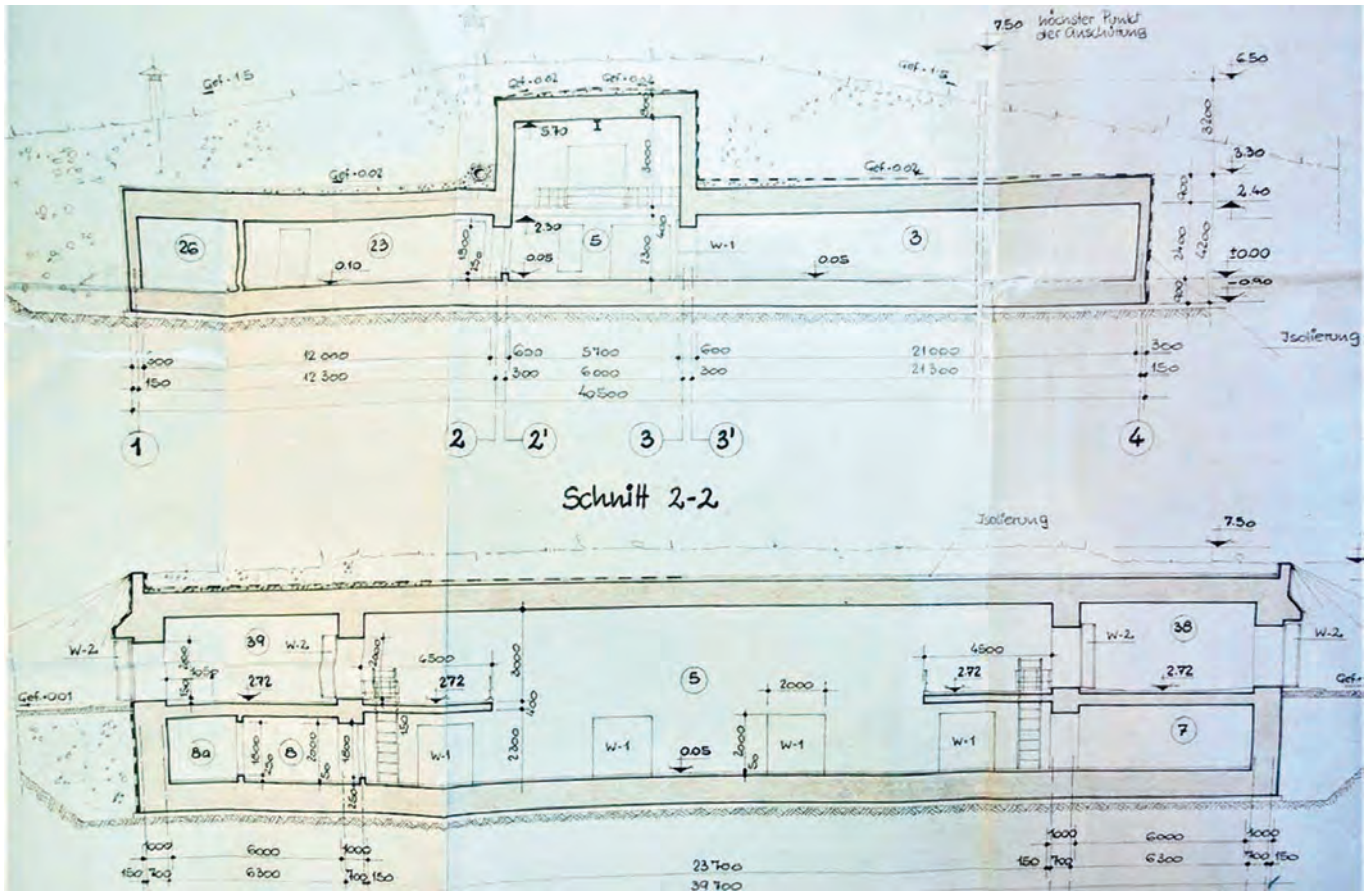


Diagram showing lateral and longitudinal sections of a T-7 bunker. Photo Mieczysław Żuk

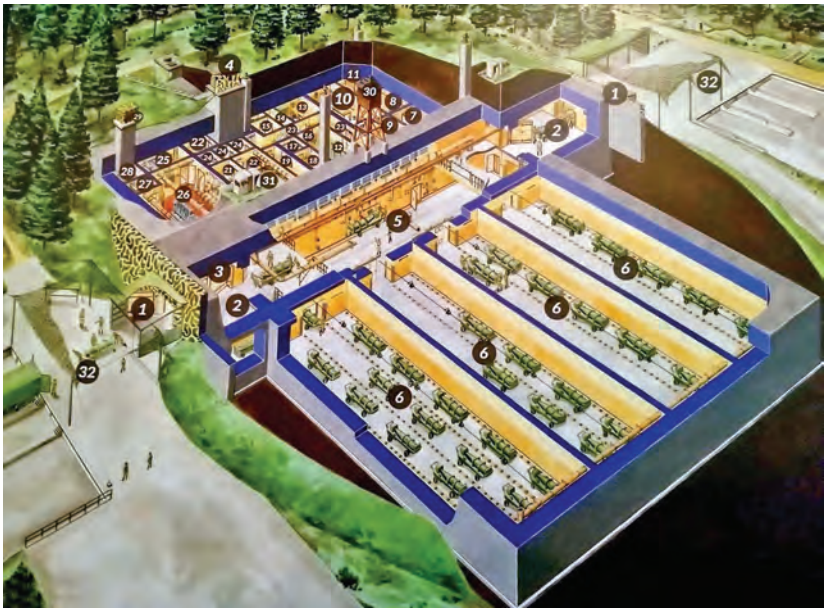
The NATO Inspection team prepare to...inspect. Photo Mieczysław Żuk

Entrance to the Granit bunker. Note the personnel access door set into the main blast doors. Photo Dave Maguire

The base occupied 110 hectares surrounded by a double barbed-wire fence. It consisted of two main parts: the Barracks and the "Obiektu Ścisłego" - literally, "Strict Object" (called by the Russians the "technical territory"). The former contained the accommodation for the personnel and their families, garages and all other buildings needed for the normal functioning of a base. The two T-7 bunkers, numbered 17 and 18, were built within the Strict Object to store the tactical nuclear warheads.

After taking over the complex, the Russians subsequently added a third "Granit" bunker for additional warhead storage. This was a standard, pre-fabricated tubular concrete structure, comprising only a single chamber and fitted with a much cruder set of blast doors at each end.

The Strict Object was contained within, but separated from the rest of the base by its own secure perimeter. This comprised, firstly, a solid concrete slab wall 2.5 metres high, surmounted with barbed wire. Beyond this



The second T-7 bunker. This was orientated at 90 degrees to the other one to mitigate blast effects. Photo Dave Maguire

was a "Sosna" (Pine) type security fence of low-voltage electrified double barbed-wire. This fence was divided into sectors and any break in it sent an alarm signal to the guardhouse to initiate an armed response to the appropriate point.

One of the two T-7 bunkers now houses the Podborsko Cold War Museum. This museum also conserves the third, Granit, bunker. The other T-7 bunker is extant, but was used as a 'donor' in restoring the one opened as a museum.

The structure of the bunker

The T-7's double blast-doors are impressive, but the bunker itself is not massively constructed: the thickest part of the roof is only 90 cm. This is because it was not designed as a combat bunker, but as a storage bunker. The intention was to deploy the warheads ahead of any likely NATO strike.

Isometric plan of the T-7 Bunker, drawn by Robert M Jurga. Photo Dave Maguire

The structure of the bunker provided some additional protection for the crew and warheads. The bunker is divided into three parts, longitudinally. The warhead storage and the technical & crew facilities were located

T-7 bunker airlock, seen from inside the inner blast door. Photo Clive Penfold

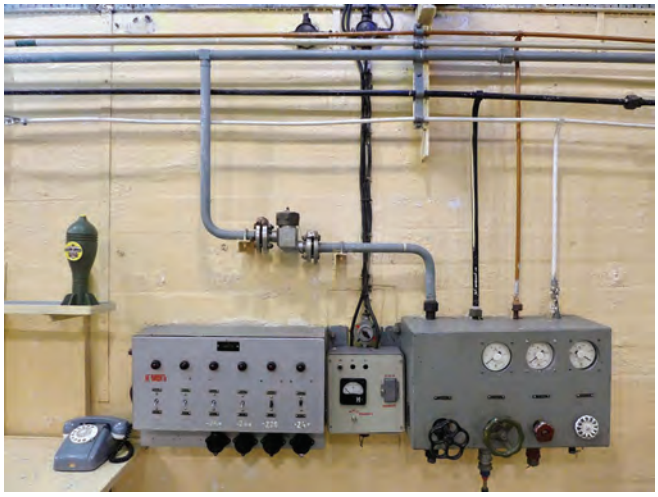
to either side of the main hall, buried beneath the rising ground level. The main hall, in the centre, had little protective earth cover.

In the event of an explosive impact on the facility, the roof of the main hall would have collapsed inward, theoretically without damaging the weapons storage area or technical section - in which the crew was located. In principle, the crew would have been able to escape through the emergency exits, and any warheads buried inside could have been dug out subsequently.

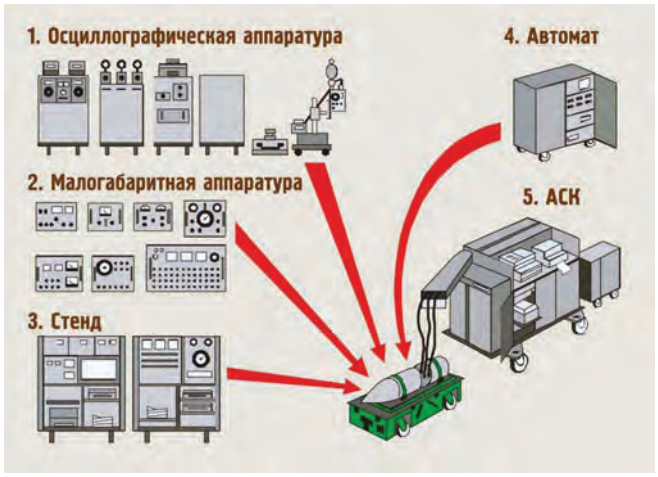
Access door to the emergency exit stairs which surface above the bunker in a very small building. Photo by Tim Wellburn

The Main Hall. The stairs just visible in the foreground were retrofitted. Personnel access to the lower level would have been via vertical ladders. The technical block is to the left on the lower level and the warhead storage rooms to the right. Photo Tim Wellburn

The main, or manoeuvring hall of the bunker was where the trolleys carrying the warheads were accepted into the facility and checked to ensure the weapons met the specified parameters. All subsequent work on them was also carried out in this area, two stations being provided for routine warhead servicing and testing.



Warhead testing station. As well as facilitating electronic testing, the station enabled different gases to be flushed through the weapons' systems. Photo Tim Wellburn



Possibly not all one needs to know to service a nuclear warhead? Photo Mieczysław Żuk

After the incoming warheads were checked, the trolleys were pulled into one of the four storage rooms situated to one side of the main hall. The trolleys were secured to the ground using anchors, attached to prepared holes in the floor. This was so that, in the event of an explosion outside, the warheads stored within the bunker were not dislodged, risking damage or worse.

A dummy warhead on an original trolley. Note the holding down brackets fixed into the floor slots. Photo Tim Wellburn

The technical area

To the other side of the main hall were the technical & crew rooms of the bunker. This area was hermetically separated from the rest of the facility.

The entrance to the technical block from the main hall. Photo Dave Maguire

A laboratory was also located on this side of the bunker, itself hermetically sealed from all other facilities, with separate air extraction direct to the exterior. This area was used when work had to be done on parts of the nuclear warheads that posed a radiation threat to the crew. A sealable room beyond provided isolated storage for any extraneous radioactive material.

The author, Mieczysław Żuk, explains the compressed air and gases plant. Photo Tim Wellburn

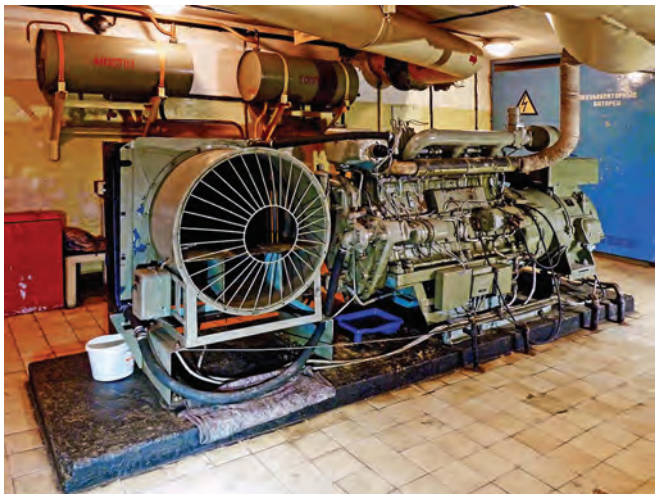
The laboratory fume cupboard and equipment. Photo Tim Wellburn

On entering the technical area from the main hall, the first room encountered was equipped with carbon dioxide cylinders which could extinguish a fire anywhere in the bunker. The next room was a technical facility containing a compressor, a vacuum pump, helium cylinders, fresh air cylinders, etc.

The technical block communicating corridor with its numerous airlock doors separating the various zones. Photo Clive Penfold

Other rooms provided for the crews' rest and hygiene requirements. In the control room, all the signalling cables from the entire bunker converged, enabling the crew to control the operation of all equipment throughout the bunker (fans, compressors, electromagnets and many other devices).

In the technical area were also located the equipment and facilities that allowed the crew to work in the event of a nuclear strike, including a water tank with a capacity of 3.5 cubic metres, FP-300 air filters and a generator set that would provide power in the event of an external power cut.



The stand-by generator - which is still capable of being run. Photo Dave Maguire

The FP-300 air filter plant. Photo Tim Wellburn

The logistics of war

What was stored in the bunker? A file entitled "*Operation Vistula*" has been located, which contains all the documents regarding the construction of "Special Facilities", methods of transferring nuclear loads to the Polish Army and lists of the ammunition that was to be issued to them from these secret facilities.

The Poles were not to be permitted to receive nuclear warheads directly from the storage bunkers. Instead, the weapons were to be transported by the Russians to designated handing-over points. Each set of warheads was to be accompanied by a Soviet officer who knew the

A Scud missile mounted on a transporter erector launcher (TEL) vehicle. National Museum of Military History, Bulgaria. Photo Wikipedia

unlocking codes, without which they could not be used. The warheads were protected by attached KZ-6 magnetic mines, allowing them to be destroyed in the event of an enemy threat.

Documentation shows that Object 3001 Podborsko was to receive 45 nuclear warheads and 18 nuclear air bombs. The total power of the Podborsko nuclear stockpile for the Polish Army was 19 megatons: a thousand times more than the "Little Boy" atomic bomb dropped on Hiroshima.

The missile sets for which the warheads were intended were:

Elbrus 9K72 set (SS-1c Scud-B) - 13 warheads;

Luna set - M 9K52 (FROG 7a) - 26 warheads;

Toczka set 9K79 (SS-21 Scarab) - 6 warheads.

How many additional tactical nuclear warheads the Russians had accumulated at Object 3001 for their own use, can only be guessed at: certainly a lot, given that they found it necessary to build the Granit third warehouse.

Interior of Granit warehouse bunker. Photo Tim Wellburn

Acknowledgements

Thanks are due from the visiting Sub Britters to Richard Hill for arranging the visit and to the author, Mieczysław Żuk, for guiding us through the facility and for providing this article.

Photographs are by Dave Maguire, Clive Penfold, Tim Wellburn and Mieczysław Żuk.

Sub Brit Membership Survey Results

Neil Iosson

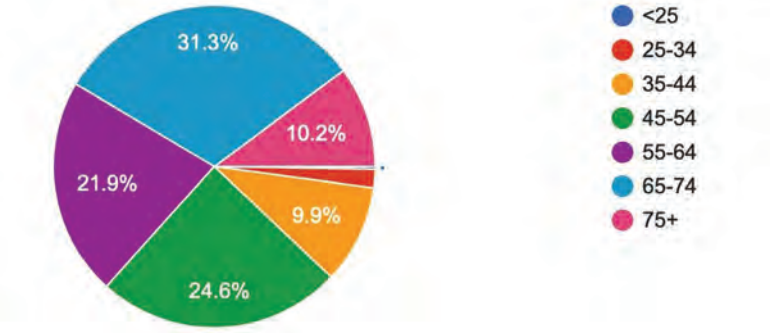
Thank you to everyone who took the time to complete our recent membership survey. We had 378 responses (from a membership of c.1,000). A summary of the responses is presented below and in the next issue of *Subterranea* the Committee will provide their responses, observations and action plans.

1. Follow-up

We will be following up individual feedback, offers of help and suggestions – in some cases we already have. A more detailed version of the survey report is available to view on the Members' Forum.

2. Age

Sub Brit is an organisation of older people. Only eight members under the age of 35 responded (2.2%) and 155 people were 65 or older (41.5%).



3. How did you hear about Sub Brit?

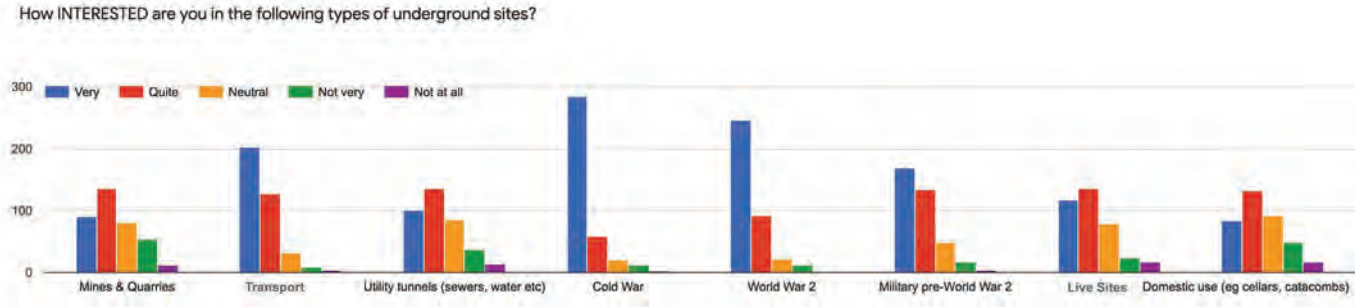
The vast majority of members either heard by word of mouth (32.9%) or via our website (32.1%). Only 17.1% found out by a media or web article and 6.4% through a site visit.

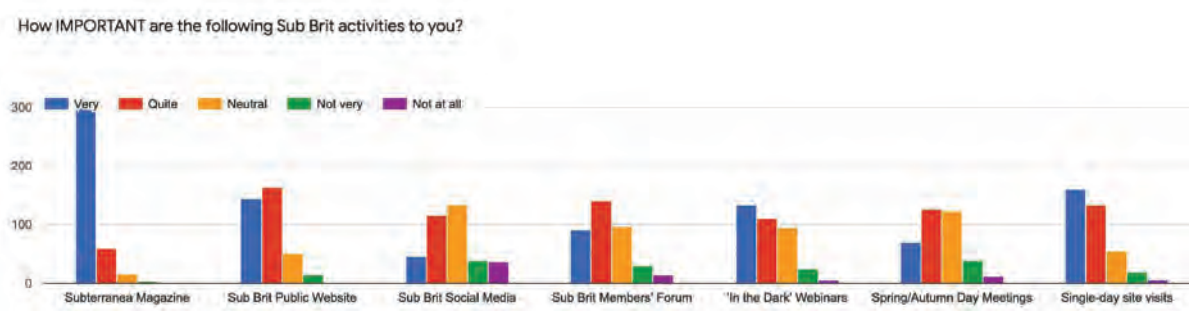
4. What prompted you to join Sub Brit?

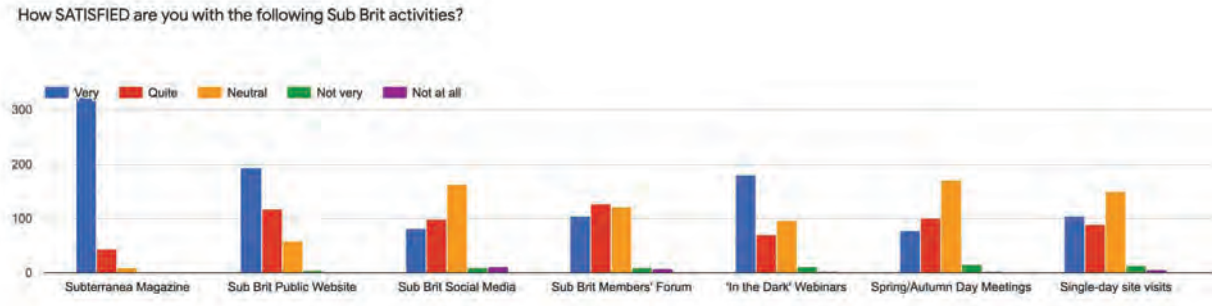
This is a free text response and best illustrated visually with a word cloud. The size of the word represents the frequency it appeared in the 366 responses (having filtered out common words like 'the' and 'a').

5 – 8. Interests and Activities

The graphs for this have been trimmed slightly for space.



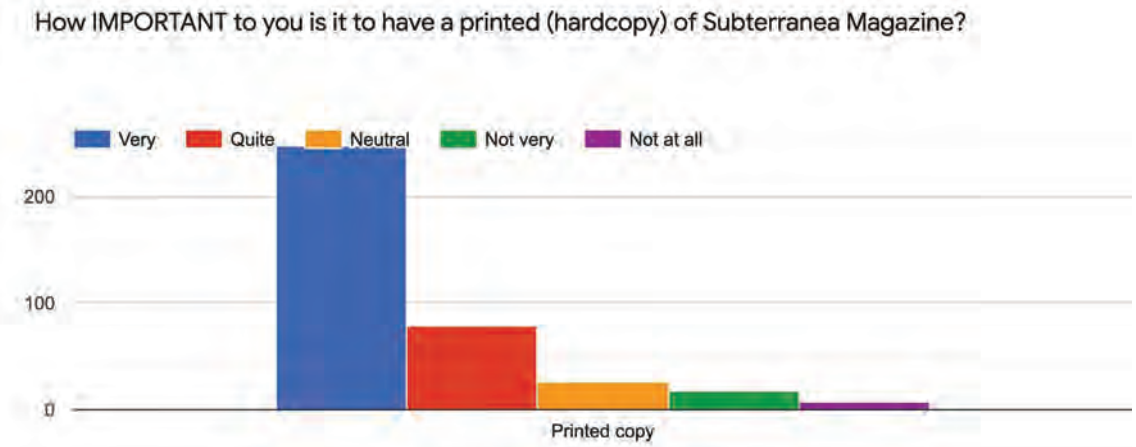




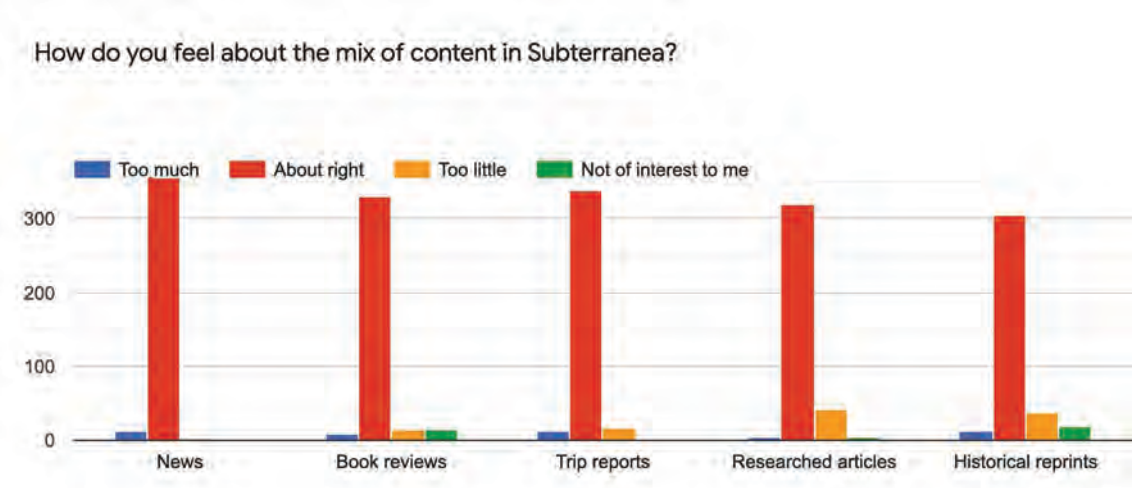
9. Should Sub Brit do activities differently? What additional activities should be offered?

These are free text responses that are being analysed.

10. How important to you is it to have a printed copy of *Subterranea*?



11. How do you feel about the mix of content in *Subterranea*?



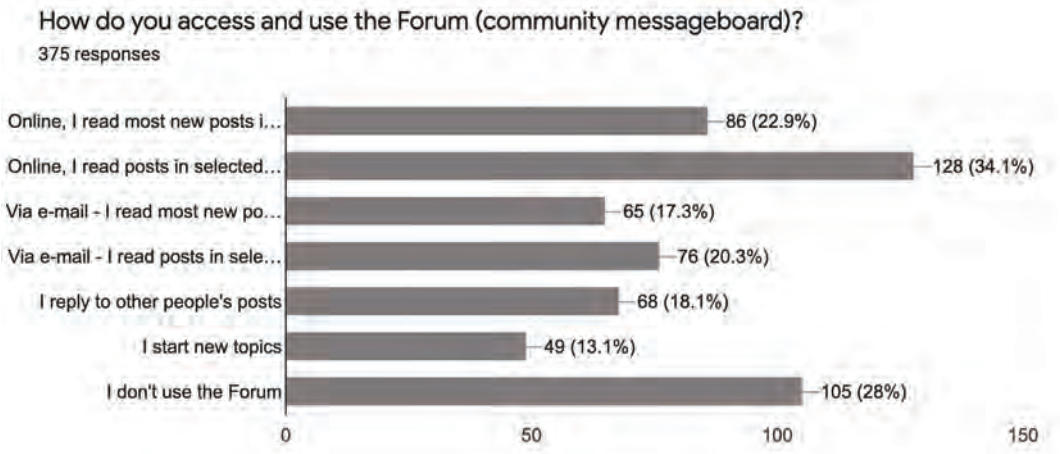
Free text response being analysed.

12. Improvements to *Subterranea*

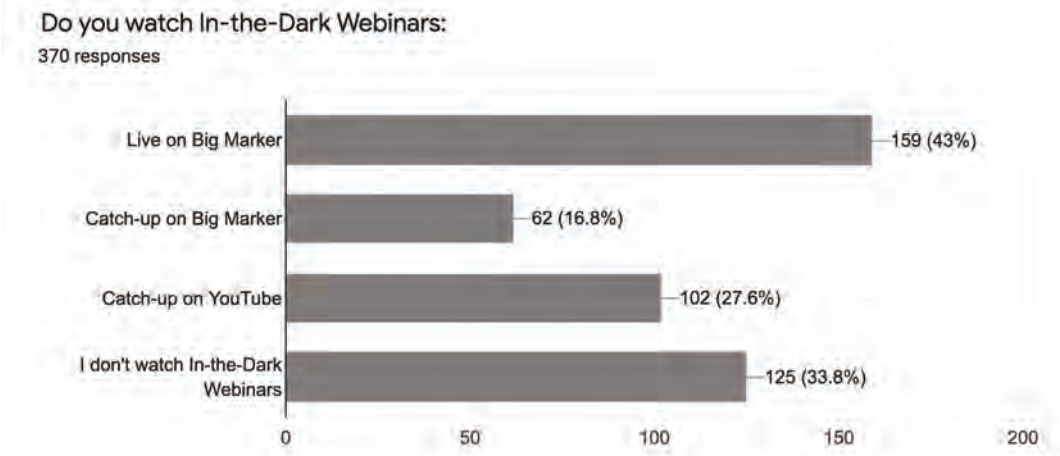
Free text response being analysed.

13. How do you access the community forum? (Multiple responses permitted)

28% of respondents don't use the forum. Both the online website and the email digest are widely used.

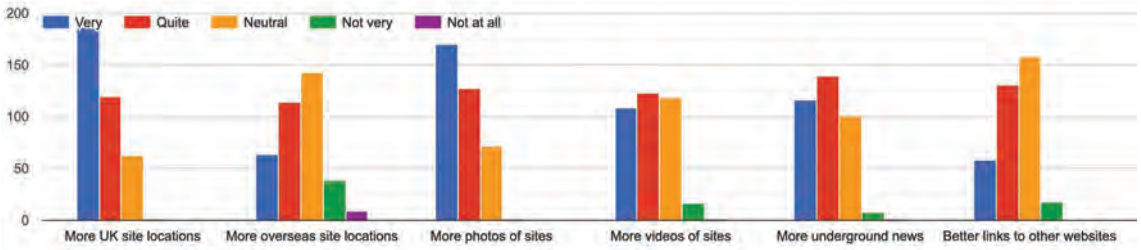


14. Do you watch the *In-the-Dark* webinars?



15. How interested would you be in changes to the public website?

There was strong interest in covering more UK site locations and also in increasing the number of photographs. This is entirely dependent on member submissions, and we welcome all contributions. Please send your submissions by email to webmaster@subbrit.org.uk

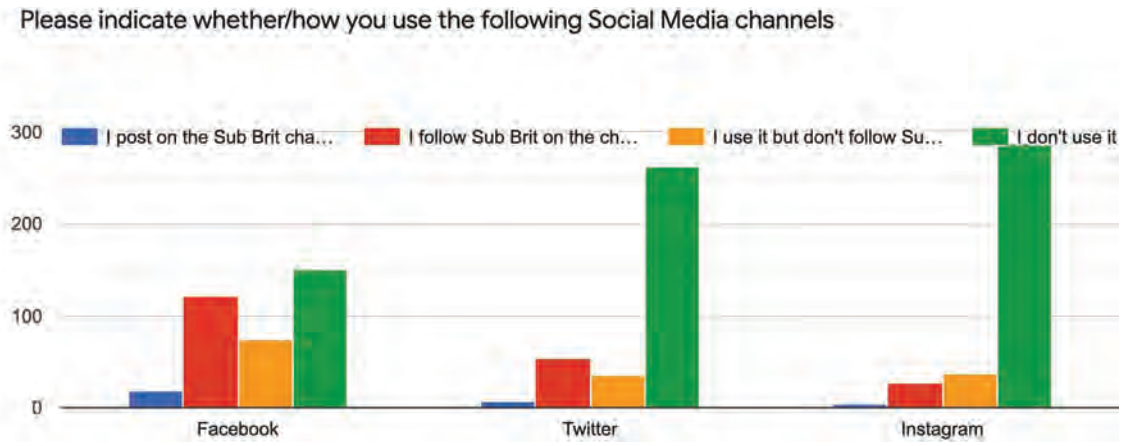


16. Branded merchandise

There was not much interest in purchasing Sub Brit branded items (46 very interested; 107 quite interested with 212 being neutral or negative) and even less in buying third-party items via the website.

17. Use of social media

There is relatively little use of social media by members and Facebook is most popular of the three channels that Sub Brit uses. From a public perspective the Sub Brit Facebook site has wide interest and currently has 7,418 people following it from around the world.

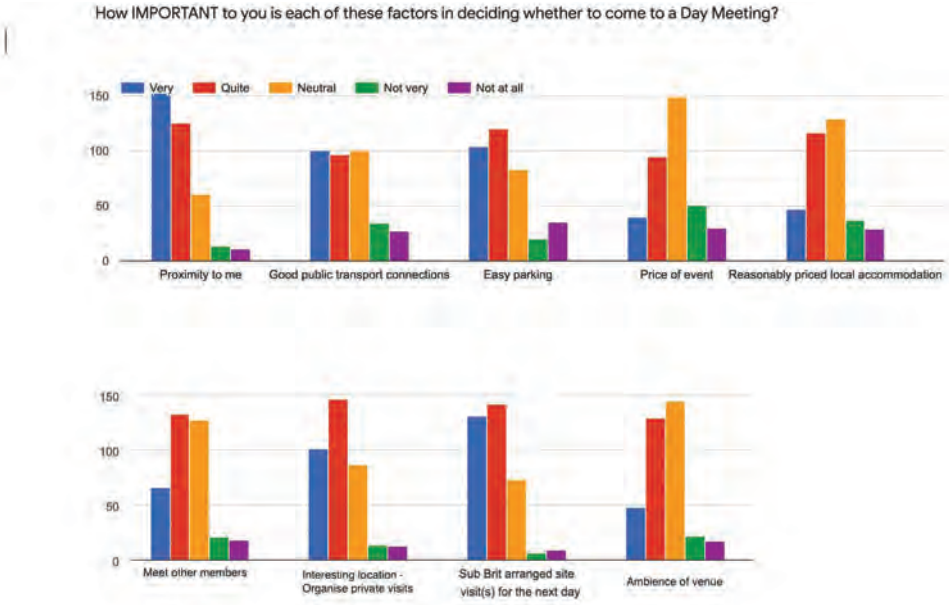


18. How many day meetings should we run each year?

57.2% of people had no preference and 31.8% wanted two per year and 10.4% to have just a Spring meeting and move the other to *In The Dark* webinars through the year.

19. What factors are important about day meetings?

Members were generally interested in good transport connections (either public or parking for a car) and location for site visits and less sensitive to costs.



20. Types of site visits

207 respondents had been on a site visit (not linked to a day meeting) and 101 had been on a site visit linked to a day meeting. Multi-day trips are less popular; 75 had attended a multi-day trip in the UK and 83 abroad. 124 members had not done any site visits.

21. Areas where you would be willing to help

There was support expressed for all the main areas of Sub Brit's activities including *Subterranea* magazine content, website content, organising meetings and site visits. The Sub Brit committee are working through the details and contacting members by email.

We also had 35 members who offered their skills and help, but did not leave their name or email in Question 1 – so we have no way to contact them. If you were one of these volunteers, or you offered help and haven't yet heard from Sub Brit, please get in contact by email to info@subbrit.org.uk and we will take it forward.

Sub Brit is a volunteer-run organisation – there are no paid staff and everything it delivers relies on members offering time, energy and good will. With more input we will be able to organise more site visits, expand the website, continue the success of *Subterranea* and share our passion for underground spaces.

Prize Draw Winners

242 people included their contact details in the survey and we randomly drew out the winners. Five members have won an extension to their Sub Brit membership: Duncan Hawkins, London Matt Hardiman, Epping Mike Kendrick, Waterlooville Paul Fields, Dunmow Jason Guth, Epping

Thank you to everyone who participated.

Injured caver rescued after 54 hours underground in South Wales

Roger Gosling

Rescuers waiting for their turn with the stretcher

The recent successful rescue of an injured caver in South Wales attracted huge media attention. Here exclusively for *Subterranea* readers are details of events as they unfolded.

Saturday 6 November 2021

George Linnane and two colleagues went underground in Ogof Ffynnon Ddu (Cave of the Black Spring) in the heart of the Brecon Beacons National Park about 10am. Their group of three experienced cavers entered the cave system via the middle entrance (Cwm Dwr) on a through trip to the top entrance. After about an hour, the group were crossing a rock bridge; the first person crossed ok but when George went across a rock gave way and this resulted in a fall of about 27ft into a rift. Serious injuries were very obvious and one member of the party exited to raise the alarm at about 1pm.

Due to the nature of the Cwm Dwr series and George's injuries it was not possible to exit via the entrance that they had come in by, so it was necessary to carry him out of the cave via Top Entrance. A normal through trip would take between 4 and 6 hours. A caver being carried on a stretcher would take at least ten times as long to exit as on a normal caving trip.

Sunday 7 November

The carry of the stretcher continued.

Monday 8 November

At 7:45pm the casualty was brought out of the top entrance of the cave system, then taken down the mountain in a cave rescue Land Rover to be transferred to an ambulance and onwards to hospital in Cardiff. His injuries included broken tibia and fibula, chest injuries, broken jaw and teeth, broken collar bone and considerable chest injuries, causing damage to his spleen.

Location

Location of Ogof Ffynnon Ddu

Ogof Ffynnon Ddu is on the west side of the Brecon Beacons and was discovered by members of the South Wales Caving Club (SWCC) in 1946. Situated in a nature reserve, access

to the cave system, which has three entrances, is usually recommended for more experienced cavers rather than novices and access is controlled with a permit issued; all the entrances are kept locked. (The through trip this group were doing is for experienced cavers only.)

The Rescue Callout

One of George Linnane's caving party exited the system the way they had gone in. The Cwm Dwr entrance is a couple of hundred yards from the South Wales Caving Club headquarters at Penwyllt.

The Cwm Dwr series starts with a vertical descent in concrete pipes, then soon follows a series of crawls and boulder ruckles. This is not too hard for an experienced caver (I have several times undertaken the through trip to top entrance), but would be a VERY awkward carry with the casualty needing to be in a stretcher.

The local cave rescue group, South and Mid Wales Cave Rescue Team (SMWCRT) needed to call on other rescue teams and during the course of the rescue, assistance was called for from Gloucestershire Cave Rescue Group, Mendip Cave Rescue, Midlands Cave Rescue Organisation, Derbyshire Cave Rescue Organisation, South East Cave Rescue Organisation, Upper Wharfedale Fell Rescue Association, Cave Rescue Organisation (Yorkshire, the first cave rescue group founded) and Devon Cave Rescue Organisation, meaning nine different CROs were involved. Some of these teams brought specialist equipment with them.

All cave rescue team members are volunteers who are experienced cavers. In this case, Mountain Rescue was also on site to assist the rescue effort as well as a HART team, a specialist group of paramedics trained to deal with large-scale incidents, but in this instance, they also helped with the supply of specialist drugs and oxygen cylinders. The Severn Area Rescue Association also helped by bringing oxygen cylinders over from Gloucestershire, as stocks in South Wales were severely depleted.

Assessing the rescue route

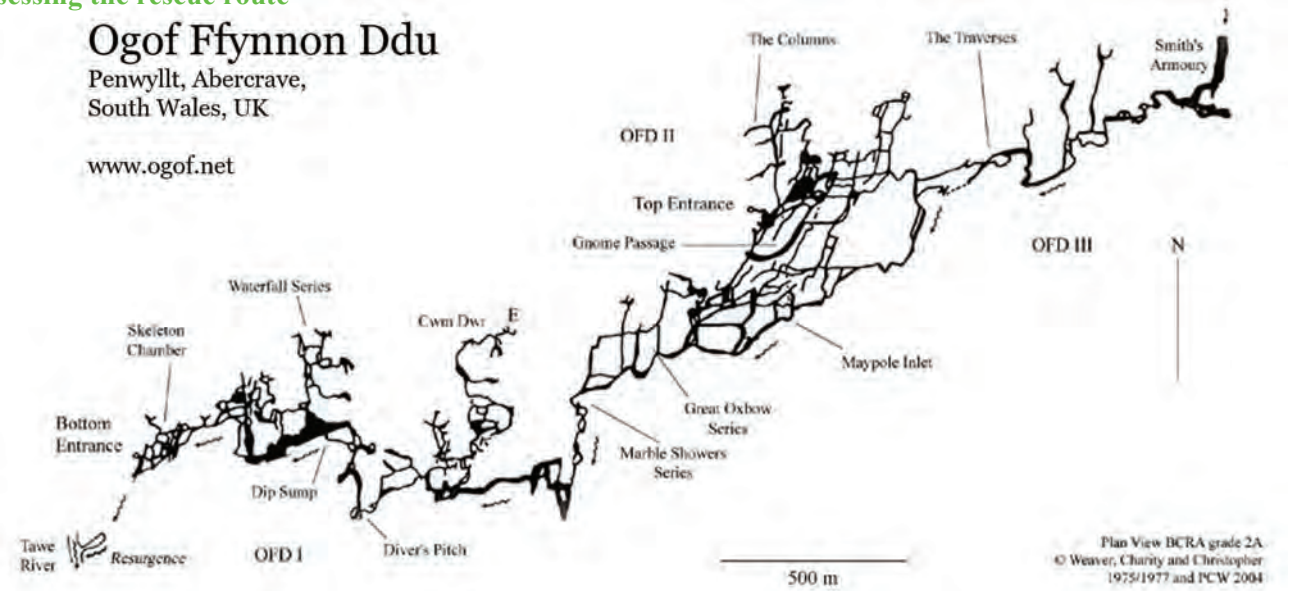
OFD is the third longest cave system in the UK with about 32 miles of passage in total and in vertical range (from the lowest point below the bottom entrance to the highest point in the cave is about 900ft).

Due to the nature of his fall, it was initially suspected that George had spinal injuries as well as the more obvious broken tibia and fibula, chest injuries and broken jaw. So this added to the decision to use the top entrance.

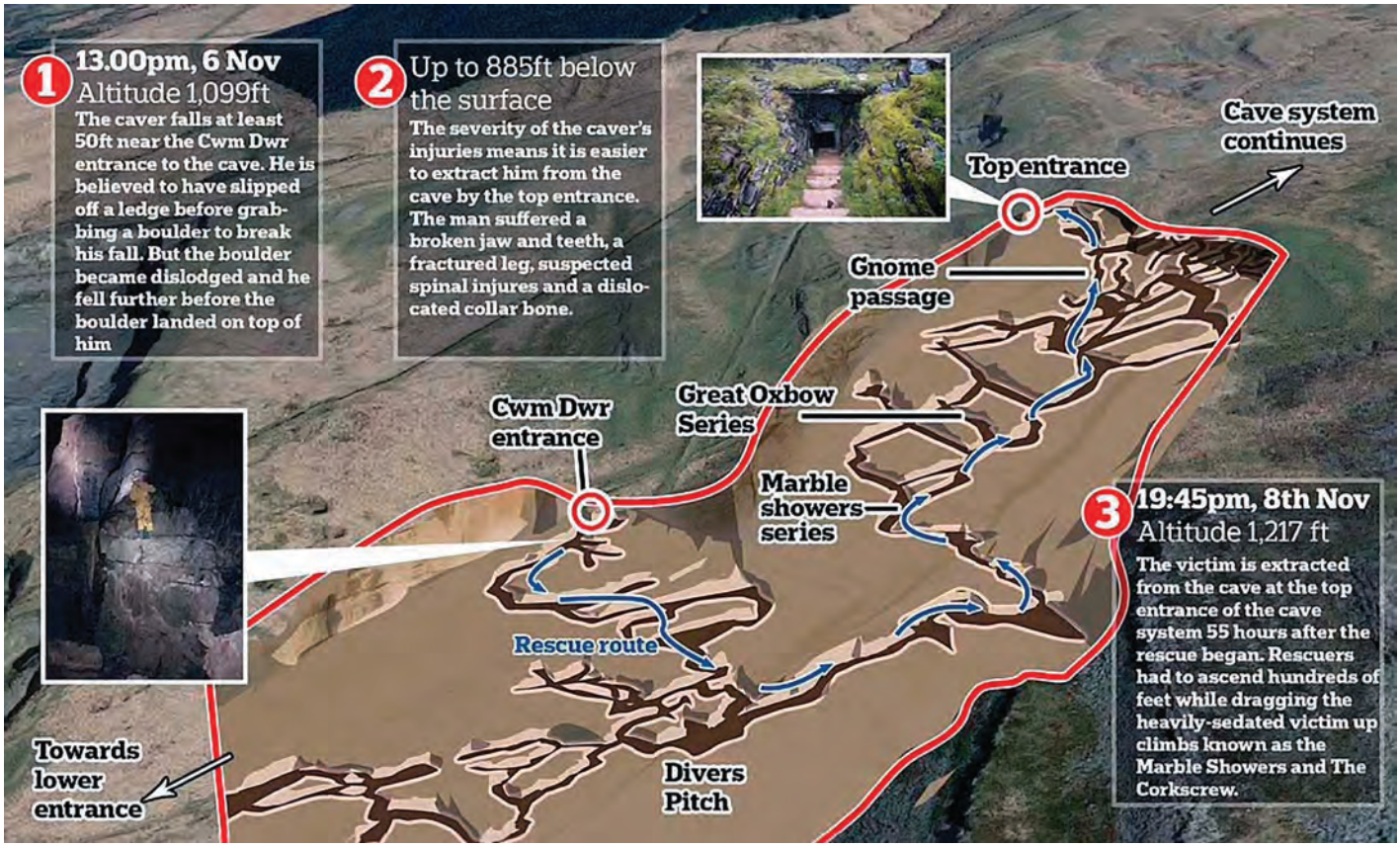
Part of this route is in the active streamway of the OFD system; due to the nature of the streamway, this needed the rescuers in places to lie in the stream and pass the stretcher upstream above their heads making full use of the specialised floating stretcher. Where the rescue route leaves the streamway is a series of technical climbs which is the normal route for cavers. However, these are bypassed by the use of what is known as the 90ft Rescue Pitch. This is much easier for the stretcher than the cavers route.

Ogof Ffynnon Ddu: Part of the large passage near top entrance

The stretcher was hauled up this pitch. Once at the top, there is still about an hour of normal caving along large passages, with climbs and some tight parts too, over constantly uneven terrain. The last part before top entrance is a large chamber several hundred feet long.



Survey of OFD. Note this is very much a simplified survey, many passages are omitted for clarity and the cave is on several different levels


1 13.00pm, 6 Nov
Altitude 1,099ft
The caver falls at least 50ft near the Cwm Dwr entrance to the cave. He is believed to have slipped off a ledge before grabbing a boulder to break his fall. But the boulder became dislodged and he fell further before the boulder landed on top of him
2 Up to 885ft below the surface
The severity of the caver's injuries means it is easier to extract him from the cave by the top entrance. The man suffered a broken jaw and teeth, a fractured leg, suspected spinal injures and a dislocated collar bone.
Top entrance
Cave system continues
Gnome passage
Great Oxbow Series
Cwm Dwr entrance
Marble showers series
3 19:45pm, 8th Nov
Altitude 1,217 ft
The victim is extracted from the cave at the top entrance of the cave system 55 hours after the rescue began. Rescuers had to ascend hundreds of feet while dragging the heavily-sedated victim up climbs known as the Marble Showers and The Corkscrew.
Rescue route
Towards lower entrance
Divers Pitch

Due to George's injuries, the route to be used was carefully considered and involved a long carry

This would normally take about 10 minutes caving, but probably took over an hour carrying the stretcher.

Top entrance (the exit in this case) is through a square hole about three feet across; this has a locked door to prevent access to anyone without a permit to enter (the entrance to Cwm Dwr is similar in this respect).

Moving the casualty

On a rescue practice, a casualty in a cave rescue stretcher ready to be carried out

George's injuries meant that he had to have his leg splinted, his jaw stabilised with bandages and then he was placed in a stretcher. He was given medical treatment underground as soon as possible and cavers stayed with him while the rescue plan was put into place and while the necessary equipment for the carry was being taken into the cave.

Rescuers worked in groups passing the stretcher along, with several teams in use at any one time. Most rescuers worked in shifts of 10 to 12 hours.

OFD Streamway on a rescue practice

Due to the time expected for the carry and also as part of route is in an active streamway, hypothermia would be a problem (for some of the rescuers too, eg underground controllers and comms). Nowadays cave rescue groups use a heated gilet powered from battery packs; modern lightweight batteries can store a lot of power. Cave rescue groups also still have a device called a 'Little Dragon' (developed in Wales) from which the casualty can breathe hot air - heated by a chemical reaction; due to badly fractured jaw, not practical for this rescue. He was in a lot of pain and needed to be given strong pain relief.

Cave rescue doctors, as well as the carrying teams, worked in shifts, keeping a close eye on his condition. Due to the injuries to his mouth, his breathing was

George Linnane is carried along the OFD streamway

shallow with low oxygen stats, so he was provided with oxygen from cylinders taken into the cave. These lasted from 1 to 2 hours each and therefore a lot of cylinders were required. Additional cylinders were provided by the HART team and a further supply was brought over from Gloucestershire by a member of the Severn Auxiliary Rescue Association who was contacted by GCRG.

Communication is essential

During the time that George was being taken through the cave, it was important that the underground co-ordinators remain in contact with the surface controllers – for example to request any equipment not already to hand, to report on progress through the cave and to pass on details of the condition of the casualty. Nowadays text messages can be sent through the rock to the rescue co-ordinators, using equipment called 'Cave Link'.

This is a vast improvement on when I was involved in cave rescue; originally, we had to lay telephone cables through the cave (and coil them up again afterwards). This method was not very reliable; damage to the cable from being trodden on if not laid correctly could easily break the link. Then came the 'Ogofone' using low-frequency radio for voice communication through solid rock. This and the modern test method 'Cave Link' require the setting-up of an antenna underground; this is two linear cables with ground plates at each end approximately 30m apart.

After being brought out to the surface, George was applauded by rescue team members, before being placed into a cave rescue Land Rover to be transported down the mountain. His first words when out were "I'm mighty glad to be out of there!"

Ogof Ffynnon Ddu Top Entrance

Cave rescue members waiting for the stretcher to be passed out of top entrance

South and Mid Wales Cave Rescue Team's Land Rover

The elapsed time underground was just short of 54 hours; George had survived the carry-out well, considering how long he had been underground, partly due to the fact that he is a very fit person.

Once back at the SWCC headquarters in Penwyllt, he was transferred to a road ambulance, assessed and then taken to hospital in Cardiff for treatment. Use of the air ambulance had been considered, but the weather conditions and the fact that his injuries were not life-threatening meant that this was not used.

Whenever there is a cave rescue, the equipment used has to be brought back out of the cave. A lot of the equipment was washed immediately on return to the rescue store so that, if required, it could be redeployed. However, there was still a large quantity of equipment left in the cave and it has taken a number of trips to get it all out, then cleaned, packed and ready for future use.

During the long rescue local people, shops and other businesses donated food and drink to keep the rescuers fed. The team would like to extend a special thanks to all concerned and the kind folks at Highland Spring for generously supplying vast quantities of bottled water to keep the rescuers hydrated and able to work hard.

There were many acts of kindness like this and it all makes a big difference on a long rescue. Also of course, the rescue was co-ordinated from the SWCC cottages; this makes so much difference, as opposed to having to set up the co-ordination centre in a tent for example.

Record for longest cave rescue in Wales

This rescue took 54 hours and 45 minutes from when the call-out was made, spanning three days. George was in hospital for 16 days.

The previous longest rescue in Wales was in 1980, when Tim Flannigan broke his leg a long way into the Agen Allwedd cave system at Llangattock. He was very unlucky in that it seemed a boulder randomly fell out of the passage above him (even though no one was up there). That rescue took 41 hours due to the constricted passages of the route out. I was involved underground taking food to the kitchen and also helping at the entrance when he emerged (I went home between these for a good night's sleep).

That was 41 years ago, when cave rescue equipment was much less refined, so progress underground was slower. At the time, Tim's survival was attributed to a number of factors, not least of which was the skill and determination of the cavers in the rescue team of the day. The technology then was a lot more basic, but no rescue will ever succeed without human skill and determination, and that is as much the case today as it was all those years ago.

George Linnane

Epilogue

Sub Brit's underground trips cover a lot of different types of terrain, from mines and quarries to wartime structures. Although, for quite a lot of the time underground, often the trips are 'just walking', there is still always the risk of falling, leading to injuries. Specialised rescue teams may be required for recovery to the surface. It is quite possible that cave rescue teams would be called on. Several Sub Brit members may be involved as volunteers in various cave rescue groups.

All cave rescue teams are voluntary organisations, providing assistance to people and animals in need underground. The teams rely on donations from members of the public to fund their essential life-saving rescue service.

The stretcher being carried through one of the easiest parts of the cave

George's mother, Sally Linnane-Hemmens, said the long wait for her son to be brought to the surface had been 'horrendous'. She set up a fundraiser for the South & Mid Wales Cave Rescue Team which led the operation. She posted: "...these guys, along with several other cave rescue teams from across the UK, saved my son's life."

George Linnane is an experienced caver, a cave diver, scuba diver and snowboarder. He had been trapped underground for 50 hours-plus and was badly injured. At the time of writing (mid-November) he is making a good recovery in hospital.

A collection of news reports in print and online as the rescue unfolded (some of the more sensible ones!)

One caver said: "It is going to be a slow process but we are confident we can get him out for medical treatment. We work on the basis that it will take [at least] ten times longer to get him out than it took him to get there. So if it took him three hours to reach the spot where he was injured then it could take us 30 hours to bring him back. It is all about safety and doing it properly."

A regular caver said: "It's a well known cave system, very popular with cavers and it is in the middle of a nature reserve. It's a really popular cave system, usually

recommended for more experienced cavers rather than novices."

Peter Francis, one of the oldest cave rescuers taking part, and who is responsible for the discovery of parts of the cave, called the incident "an unfortunate, chance accident." "This incident is a one-off," he said. "Although this is a world-class cave system, it's Himalayan by cave standards, it's a fairly safe area. You're more likely to be knocked down by a bus than this happening to you."

Commenting on the condition of the rescued caver, the emergency services liaison officer Gary Evans told the BBC: "The casualty's doing remarkably well when you consider how long he's been in the cave, how long he's been in the stretcher, he's doing very well indeed. He's being assessed at the moment and we'll know more in a short while. Doctors have been sent down with bags of pain relief. He is on some pretty strong stuff and being treated with a nasal cannula."

The stretcher was transferred across this deep vertical drop on a carefully rigged rope traverse

One rescuer said: "He is extremely lucky to have survived the fall. He was unconscious for about a minute and was in hell of a lot of pain when he came around. Two of the rescuers are accident and emergency consultants so he's in good hands. He's had loads of morphine and they have fitted a cannula to get fluids into him."

Another said: "He was also unconscious for some period of time and that is also very worrying because of how far he fell. I understand he came down with the boulder and that made things worse."

Julian Carter, warden at the South and Mid-Wales rescue team, said the site where Mr Linnane fell was dry but dark and they had focused on keeping him warm and a floating stretcher was used as teams moved him along an active streamway.

He said: "It has been a challenging rescue because of where this person was – we couldn't take them out of the nearest entrance. The care has been excellent. We're very good at keeping people warm and avoiding hypothermia."

Paul Taylor, from Gloucestershire Cave Rescue Group, who acted as press liaison officer for the rescue, said: "As he was being stretchered from the mouth of the cave to a waiting ambulance, he managed to get a few words out. He said 'I'm mighty relieved to be out of there.' Thank goodness he made it. He was exhausted, of course, and he'd broken his leg, so he wasn't exactly jumping around and flapping his arms in the air, but he clearly felt that sense of relief."

Gary Mitchell, South and Mid Wales Cave Rescue Team surface controller, said: "He's in as good spirits as can be expected. The important thing now is to get the casualty the care he needs, which is getting him to a hospital. Once he's out, a cave rescue team ambulance will take him to a county ambulance which will drive him to hospital."

Peter Francis, a member of the South Wales and West Brecon Cave Rescue Team, said: "Because of the nature of the complexity of the cave, you can't just have one party doing it [moving the stretcher] all the time. People get tired and other people need to perhaps take equipment into certain areas to have it there ready when we need it. So it's a rolling programme all the time. Although we are a big rescue team, our numbers cannot cope with this sort of problem so we've had to call in other rescuers, other teams, from all over Britain."

Underground controller Julian Carter has done two shifts in the past 10 hours, co-ordinating efforts. While he described it as a 'challenging rescue', he said conditions have been generally good with water levels low and the care of the casualty 'exemplary'. As the third largest cave in Great Britain, he described its appeal: "It has three

entrances, and you can traverse each entrance around this amazing landscape. Some of it is crawling, some horrible, other parts just fabulous, through the active streamways, around the remarkable landscape." He also praised all the volunteers who have taken the day off work to help.

Rescuers from all over the country at Penwylltt, the South Wales Caving Club HQ

Paul Taylor, spokesman for the South and Mid Wales Cave Rescue team, said: "On Saturday 6 November 2021, a male caver was undertaking a trip in the Ogof Ffynnon Ddu cave system and fell, resulting in some injuries that meant he could not exit under his own steam. A fellow caver notified the police and the South and Mid Wales Cave Rescue Team initiated a response. This incident is ongoing and involves cave rescuers from teams across the UK, Gloucestershire Cave Rescue Group, Midlands Cave Rescue Organisation, Derbyshire Cave Rescue Organisation, Mendip Cave Rescue, the South East Cave Rescue Organisation, the cave rescue organisation and the Upper Wharfedale Fell Rescue Association and other associated teams. The response to the incident has continued during the night and we are moving the casualty towards the top entrance of the cave, which is located upon the mountain and will be the point of exit."

Paul Taylor said: "Caving is challenging in itself. Add into that the dimension of an injured casualty they have to move." He said taking up a man on a stretcher was a difficult process, adding: "As far as I'm aware, he's been talking to his fellow cavers, who are now his rescuers."

Speaking to PA previously, Paul Taylor said: "The incident started around 1pm on Saturday when a man who was with him alerted us that his partner had fallen. I don't actually know how many were in the group but there would've been more than two. They had gone in the Cwm Dwr entrance, which is the middle entrance, before he fell."

Mountain Rescue was also on site to assist the rescue effort as well as several ambulances and a HART team, a specialist group of paramedics trained to deal with large-scale incidents.

Further information: www.swcc.org.uk/joomla-swcc

Just prior to this extraordinary rescue, Sub Brit made a donation of £2,700 to the British Cave Rescue Council to fund casualty rescue bags and jackets. These, including special heating inserts, will be distributed to member Cave Rescue Clubs to help stabilise those being rescued, and to improve their survivability. Although much of Cave Rescue activity is in natural formations, they are also active in locating and rescuing those who are trouble in man-made structures such as disused mines. Bob Templeman is writing a short article on the project for the next edition of Subterranea

Practicalities of passing through canal tunnels

A guide to inland navigation (by both canals and rivers) in England and Wales, published in 1904, gives fascinating details of the practicalities of negotiating locks and tunnels. By 1904 the system included 45 tunnels over 100 yards long, of which ten were over 3,000 yards. The great majority had no tow-paths through them, and were very narrow at the waterline (insufficient to allow two craft in transit to pass), so a system had to be devised whereby two could not meet head-on underground. Most craft even as late at 1904 were still hauled by horses, which could not operate without a towing path. It seems the horses walked over the hill to recommence haulage at the far portal, or were exchanged for fresh horses as had been the practice in stage-coach days (a sort of horse version of the Boris bike!) In the place of horses to pull boats through, the men or women on board had to push. There were two ways to do this, 'legging' and 'shafting'. Legging called for the crew to push against the tunnel ceiling or walls with their feet. For some long tunnels, professional 'leggers' could be hired to do this. In shafting, the crew used long poles to push instead of their legs. Some shorter tunnels were equipped with iron chains hanging along one side of the tunnel, and the crew pulled on these to attain forward motion. Exceptionally, a stop-lock could be operated at one end of the tunnel to accumulate a head of water sufficient when released to cause a current in the required direction, which at least helped.

To avoid two craft travelling in a tunnel in opposite directions, an alternating timed one-way system was operated. Clearly, somebody had to be stationed at each end to regulate admission. A few tunnels by 1904 may have had telephone lines between the persons at each end.

Only the latest tunnels such as Netherton were wide enough for two craft to pass, and equipped with a path each side, and even gas lighting.

SOURCE: DE SALIS, Henry Rodolph, 1904, *Bradshaw's canals and navigable rivers of England and Wales: a handbook of inland navigation for manufacturers, merchants, traders, and others, compiled after a personal survey of the whole of the waterways.* London: Henry Blacklock & Co. Ltd: ix + 450 + 8pp adverts [A facsimile reprint was published in 2012]

St Leonard's Court Air-Raid Shelter, East Sheen, southwest London

Adrian Armishaw

St Leonard's Court and the unusual entrance to its private air-raid shelter which lies under part of the elevated lawn on the forecourt. The square panels on the grass cover emergency exits

The 17th of September 2021 marked an important day for Sub Brit as it was our first post-lockdown visit. At their appointed times, two groups of members successively assembled outside St Leonard's Court in East Sheen to visit this unusual private air-raid shelter, courtesy of Emily Lunn and Stephen Fielding of Habitats and Heritage, a local historical and environmental group, and Shaun Lamplough of the Mortlake & East Sheen Society.

An architect-designed private facility

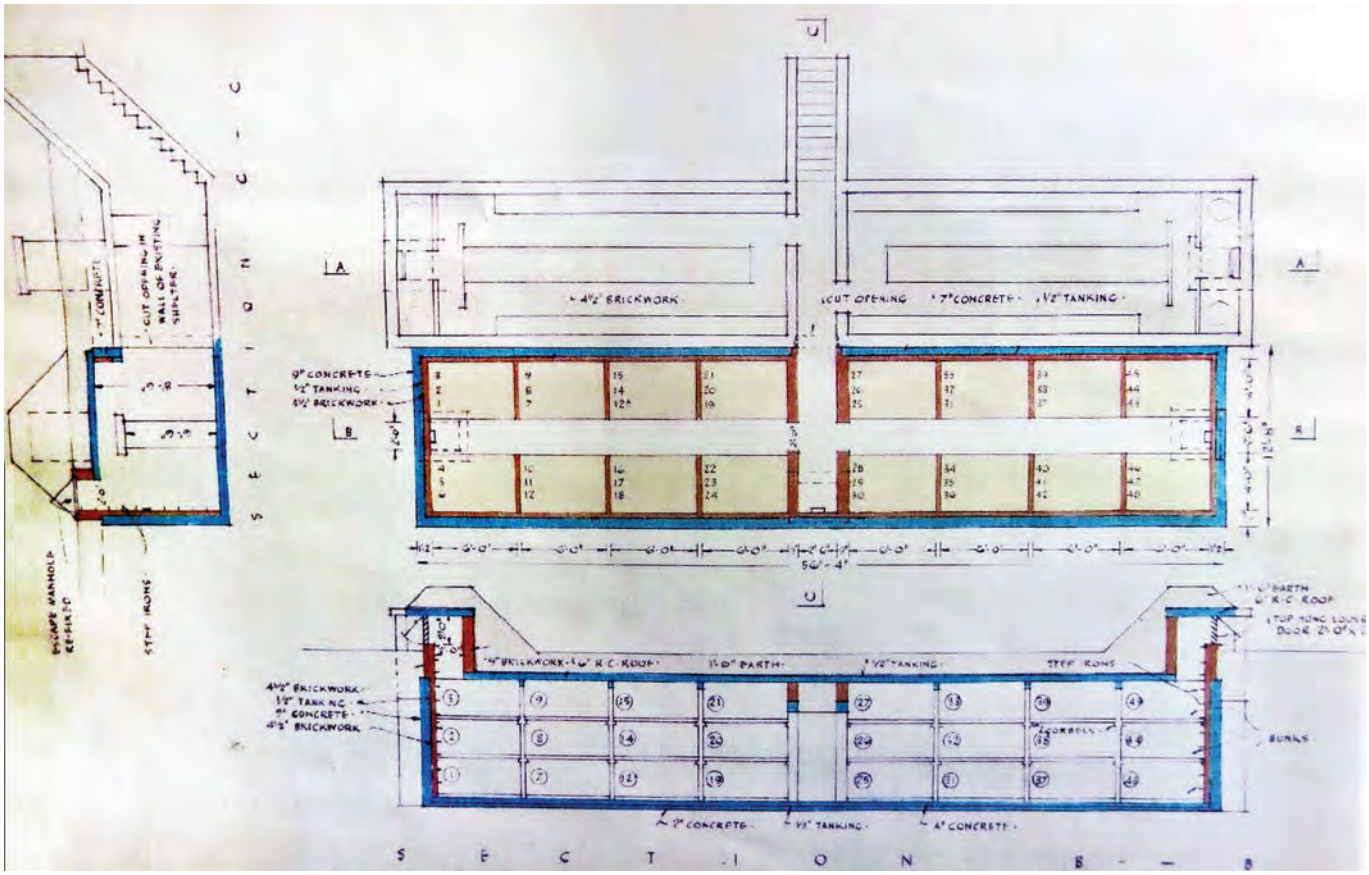
St Leonard's Court is a block of flats designed by architect Philip A W Roffey and built by developer F G Fox in 1934–38. They were also responsible for the design and construction of a number of other residential developments in the area in the mid-1930s, some of which also included air-raid shelters.

This private shelter was built in 1939 to provide protection from German bombs specifically for the residents of the 83 flats of St Leonard's Court. The *Habitats and Heritage* website indicates that the original design capacity was for 120 people accommodated in two rooms.

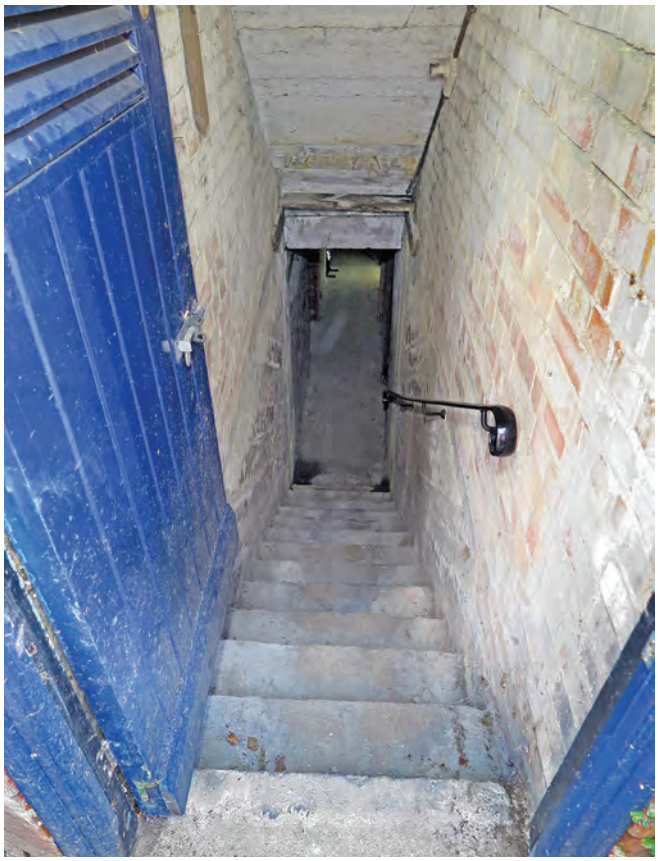
Shaun Lamplough gives an introductory talk to the assembled Sub Britters

The original design

The shelter is semi-sunken, situated beneath the raised central lawn in front of the flats, which is where we gathered for an introductory talk by local historian, Shaun. An attractive circular brick structure with a conical tiled roof forms the unusual entry to the shelter opposite the main entrance to the flats.



This is the architect's 1940 plan for the subsequent enlargement of the shelter: the uncoloured section is the original 1939 construction



The steps within the entrance 'gazebo' leading down into the shelter

Thirteen steps descend to a central corridor which has a room leading off to either side, that on the right being reserved for females; male occupants were accommodated to the left.

The female 'day room' with two lavatories at the far end

The original shelter consisted only of the two rooms nearest the entrance, now referred to as the day rooms. Each of these is rectangular in plan, beneath a flat concrete roof, providing an open space equipped with benches along either side.

At the far end a brick screen wall covers two toilet cubicles situated either side of a steel ladder leading up to a ventilation grille/escape hatch. The cubicles still have their original Elsan chemical toilets.

The dormitory annexe

In September 1940 it was proposed that a dormitory annexe with 48 bunks should be built alongside the original shelter. Access was created by knocking through the wall at the end of the corridor to connect

Original Elsan chemical toilets still equip the lavatories, this one complete with its seat. Note the handy emergency exit. File photograph: Nick Catford

with the original structure. A slight misalignment in the passage reveals the 'join'.

The stove at the end of the spine corridor. This appears to have been the sole source of heating in the entire shelter

A convenient recess at the far end of the extended spine corridor was used to house an iron stove and a small postbox. The latter carries the intriguing annotation: *All communications should be signed by those associating themselves with them*. One can only wonder at what anonymous or factional postings caused the shelter's management to resort to this instruction.

One of the dormitories showing the bunk numbering and individual shelves and light fittings. (The extraneous pipe sections visible in this archive picture had been removed long before our visit.) File photograph: Nick Catford

The two new dormitories were constructed with a series of brick-walled recesses on either side, each of which contained three levels of bunks supported on protruding rows of bricks. Each of these bunks had an elegantly hand-painted painted number on the wall and was provided with a small shelf and an individual electric light. Some of the original light bulbs and improvised lampshades remain in place.

One of the bunk individual light fittings – with a built-in shield to minimize disturbance to the sleeper opposite

Numbered clothes hooks adjacent to the bunks

The top of an emergency exit from one of the dormitories. This shows clearly the limited extent of the overhead protection provided by the shelter: blast proof, but of doubtful prospect in the event of a direct hit

Elsewhere – on the partitions between bunk recesses and along the walls of the spine corridor – correspondingly numbered clothes hooks were provided for the use of the bunk's occupant. The bunks were apparently available to the residents to rent for £7 a year.

At the far end of each room, in a corresponding position to those in the day rooms. climbing irons were set into the wall to allow escape in an emergency through hatches in the roof.

The shelter under threat

Some years ago, the freeholder of the flats planned to convert the shelter into two underground flats. A spirited campaign against this development included a petition which attracted over one thousand signatures from residents and other interested parties.

In 2007 the Council rejected a planning application and in 2008 this decision was upheld on appeal, saving the shelter and its rare fixtures and fittings. The hope is that it can be opened regularly to the public and used as an educational resource for schools and the community.

The shelter obtained Grade II listing in 2009, but problems regarding maintenance mean that it also remains on Historic England's *Buildings at Risk* register.

WORLD WAR II AIR RAID SHELTER
The air raid shelter was constructed in 1938 for the protection of those living in St Leonards Court. It was designed to hold forty eight people, approximately half the number of residents.
It consists of four compartments either side of a central corridor. The shelter is accessed down steps from the conical brick turret entrance.
It is Grade II listed in recognition of its setting, high design specification and survival of most of its original fittings which give a clear impression of how the shelter was used.
Male night room
Female night room
Male day room
Female day room
BENCH
WC
E
S
R
E = Emergency Escape Shaft
R = Emergency Escape Recess
S = Stove
Entrance
Entrance doorway down to central corridor.
Day room with wooden benches and chemical toilets.
Night room showing triple tiered bunks with individual lamps
Environment Trust
Barnes & Mortlake History Society
SUBTERRANEA BRITANNICA

This interpretation board was installed in 2014 with assistance from Sub Brit

Acknowledgments and thanks

We are grateful to Habitats and Heritage and the Mortlake & East Sheen Society for arranging our visit, and particularly to Emily, Stephen and Shaun for making us so welcome and for showing us round the shelter. We hope to arrange a return visit for Sub Brit members next year.

All photographs are by Clive Penfold unless indicated otherwise.

New tunnel for Reigate Caves complex

Peter Burgess

Rob, James and Jacob from High Peak Geotechnical with the author at Reigate Caves

Subterranea Britannica provided a grant of £5,000 towards the excavation of a tunnel in sand beds within the Reigate Caves area in Surrey. This new tunnel was excavated thanks to High Peak Geotechnical Ltd., acting on instructions from the Wealden Cave and Mine Society (WCMS).

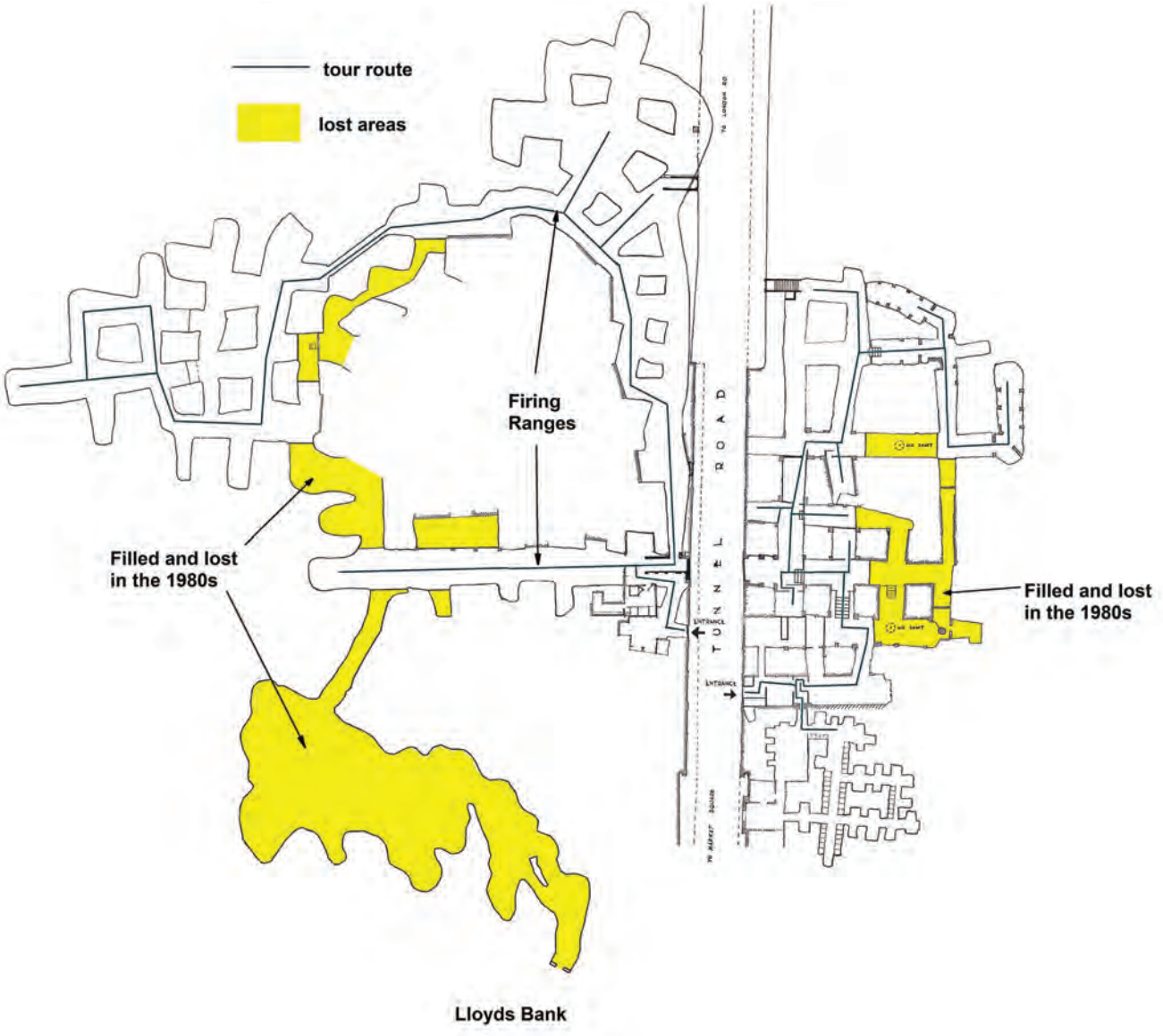
WCMS opens three caves within the centre of Reigate, Surrey, for public tours, under licence from Reigate and Banstead Borough Council. One of the three caves is an abandoned sand mine, and therefore WCMS has to comply with the legislation within The Mines Regulations 2014 under the Health and Safety at Work etc. Act 1974. This is because conducting guided tours of a mine for a fee, even though the mine is no longer producing mineral, renders the mine operational, with many safety requirements similar to those of a fully operational mine.

Ancient origins

The 'caves' in Reigate are all cut into the soft silver (silicaceous) sand of the Upper Greensand strata of the Cretaceous period that underlies the town centre, which was used for making good quality glass. They

The caves west of Tunnel Road are actually a substantial pillar and stall sand mine.

comprise a fascinating collection of storage cellars for beer, wine and the like; a medieval tunnel under the mound of the Norman Reigate Castle; and the old sand mines, excavated from the 17th or 18th century until the beginning of the 20th century.



The full extent of the caves on the east and west side of Tunnel Road, Reigate

Of the three caves operated by WCMS, only one, the Tunnel Road West cave, is considered to be a former mine from which mineral was removed. An inspection by a representative of the HM Inspectorate of Mines in 2018 resulted in a number of recommendations being carried out, including radon measurements, provision of an emergency exit, and emergency lighting. However, the most significant recommendation was that one section of the old mine, only accessible via a single linking tunnel, required an alternative way out for use in the event of an emergency.

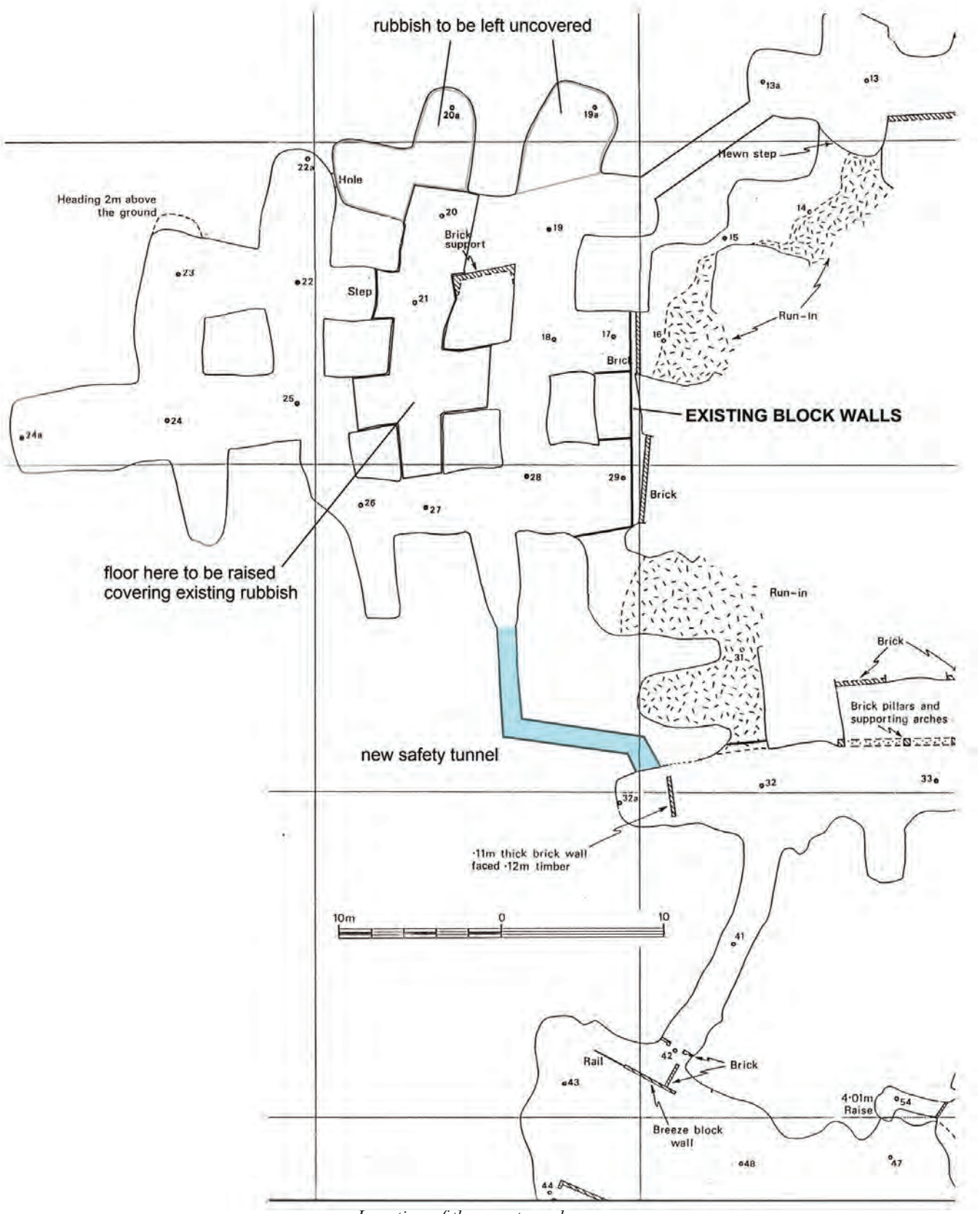
The emergency exit to the street was quite straightforward to install. When the caves were being used as an air-raid shelter during the Second World War, there was an emergency stairway installed to street level, but this was probably constructed with timber and nothing survives. However, the shaft that the stairway was built in was reused by WCMS to contain a steel ladder with a platform at street level, and a secure door was inserted into the brick wall that blocked this route after the war. This work was completed in 2019.

The footprint of the new emergency exit lies immediately outside the surface of the Reigate Castle Scheduled Monument, and consent from Historic England to carry out the work was therefore not required. This is because the boundary of the monument follows the edge of the top of the cutting that forms Tunnel Road, and as the side of the cutting is not vertical, the stairwell happens to lie in the narrow strip between the edge of the road and the top of the bank.

Then there was the more challenging job of creating a second means of egress from the back of the caves.

Sudden collapse

It would be useful to understand how one section of the system became almost isolated from the rest of the sand mine tunnels. Tunnel Road West caves were formed by sand mining using the pillar-and-stall method until the operations were ended abruptly in 1858 by a sudden collapse of the entire central section one January evening. Other, surrounding, galleries survived and access remained possible, albeit by scrambling over the edge of the fallen debris in a couple of places.



Location of the new tunnel

What remained was stabilised in the 19th century with substantial brick walls and new drives. The site was later adapted for other uses, such as storage, and as a rifle range in the 20th century. As already stated, a substantial Second World War air-raid shelter was also set up in the caves.

Stability survey

In the 1980s Reigate and Banstead Borough Council commissioned surveyors to discover the location and extent of all the sand caves under Reigate, and to identify where any instability might present a risk to the public. The result of this was that the Tunnel Road West caves, along with some other places under the town, were either infilled or further stabilised under a Government-funded scheme to address mining instability in the UK. The recommended work in the Tunnel Road West caves resulted in the innermost section of the old mine-workings being cut off by extra infilling and insertion of

block walls. To maintain access for future inspections, a connector was dug linking the rear section of the caves to the main section. It is through this tunnel that public tours take place on open days run by WCMS.

The next challenge was to identify the best place to dig a new safety connection, and to obtain all the required permissions to carry out the work. It was fortunate that a convenient route for this tunnel would be only a little over 15 metres long. This would also restore access around the collapsed central section, something that was lost after the Council's stabilisation work. It was deemed prudent, for public liability reasons, to employ a professional team to undertake the work, although there were a number of WCMS members who would have gladly got stuck in to create the new route!

Archaeological assessment

Before excavation of the required tunnel, it was also necessary to obtain Scheduled Monument Consent for the work. This is because almost all the cave lies directly beneath the scheduled Reigate Castle. Its statutory protection not only affects any surface structures and features, but also everything that lies beneath it, including most of the 19th-century sand mine.

It was fortunate that an archaeological assessment of the caves had been previously done in 2003, before the first public tours, since it was necessary at that time to remove a large amount of broken glass from the sandy floor to create a safe tourist route. As the new tunnel was to be dug in the same location, Historic England deemed the 2003 assessment sufficient to cover the new tunnel work, and permission to continue was granted, following a simple inspection by a member of the Surrey County Archaeological Unit.

None of this was easy to arrange during the Coronavirus pandemic. Those contracted to dig the tunnel had to travel and stay in lodgings during the week, and the official organisations we needed to work with were all affected by working-from-home limitations.

Work starts on the new tunnel

In mid-October 2021, site work started. It was possible to fit the work into a short window between other work flooding in as Covid-19 restrictions eased. Each day there were members of WCMS present to advise and help the High Peak Geotechnical team with the work.

The sand dug from the new tunnel was spread over the area where much broken glass and other debris had been dumped before the caves were preserved as a valuable local amenity and appreciated for their historic value. Work continued most days from 7am until after 6pm, and was completed after seven days.

The new tunnel was unlined, in common with the existing drives still standing after more than 150 years. The old drives are up to 4m high, and up to 4m wide; the new tunnel is only 2m high and 1.2m wide. Nevertheless, a large volume of sand was removed and had to be disposed of.

We did attempt digging by hand, but the sand is surprisingly resilient

The work alternated between surveying, digging, and barrowing the spoil away

An electric breaker was used to dig the sand to give an average advance of about 3 metres of tunnel each day. The sand wall peeled away like cheese, unlike digging in harder material, but this meant much more effort was required to shovel up the sand and barrow it away. The same team had previously worked on a similar tunnel in Kent, but in chalk, only managing half a metre of completed tunnel a day.

Sand being tipped onto a membrane covering old bottles and other rubbish in the centre of the pillar and stall section

An access ramp was created onto the raised area of tipped sand

Visitors will still get a good impression of the passage height despite the floor now being up to 1m higher

An area once difficult to walk through due to broken glass etc is now deep in white sand and can accommodate visitors

Spoil laying

The spoil was used to greatly improve the mine for visitors. A membrane was laid over much of the broken glass and debris, to separate it from the new material, and to prevent any of it migrating up into the clean sand. There is now a much more extensive area where it is safe to walk, and the cleaner and tidier nature of the tunnels makes the place more closely resemble a sand mine than a rubbish dump. There was just about enough room to spread the sand around and level it out, containing it in places using sandbags. The height of the excavations remains impressive.

The completed project

A few of the peripheral areas have been left untouched which means visitors can still see the sort of things that have now been buried. The original proposed route for the new tunnel was changed slightly to maintain good roof support. The team completed the tunnel in the planned location, and only 150mm adrift vertically. This step was easily lost by grading the floor level.

The High Peak Geotechnical team, comprising Mark Noble, Rob Shore, James Wood and Jacob Richardson, are to be congratulated on an excellent job. Graham Daws provided the required geotechnical reports. Funding was provided from WCMS reserves, aided by a generous £5,000 grant from Subterranea Britannica.

Tours and Open Days

WCMS are very pleased with the result, and it is now possible to run a circular tour through the caves, which will be safer and more efficient than in previous years.

Cave tours will resume in May 2022, with one Open Day each month until September. The website www.reigatecaves.org.uk provides more information on the caves and tours.

Some of the guides and helpers are also members of Subterranea Britannica, although we have now sadly lost the irreplaceable contributions of Paul Sowan, who conducted his last public tour in 2019.

The author inspects the new shiny-white tunnel

For more information on other projects completed by High Peak Geotechnical, visit :
www.highpeakgeotechnical.co.uk

Paddington Borough Control – London

Nick Catford

The entrance blockhouse on Paddington Green in January 2002. The bricked-up entrance was on the far side of the building but was too overgrown to photograph. Photo Nick Catford

A Cold War control centre for Paddington Urban District Council was built on Paddington Green to the east of Paddington Town Hall in 1954. It was a totally underground bunker with a small entrance blockhouse opening onto Paddington Green with an emergency exit escape shaft on the green nearby. Paddington Town Hall was demolished during the construction of Westway (A40) in the late 1960s. In 1965, Paddington, St Marylebone and Westminster were merged to form the London Borough of Westminster. Prior to that, St Marylebone had a control in Queens Terrace, St John's Wood. Westminster didn't build a control although that

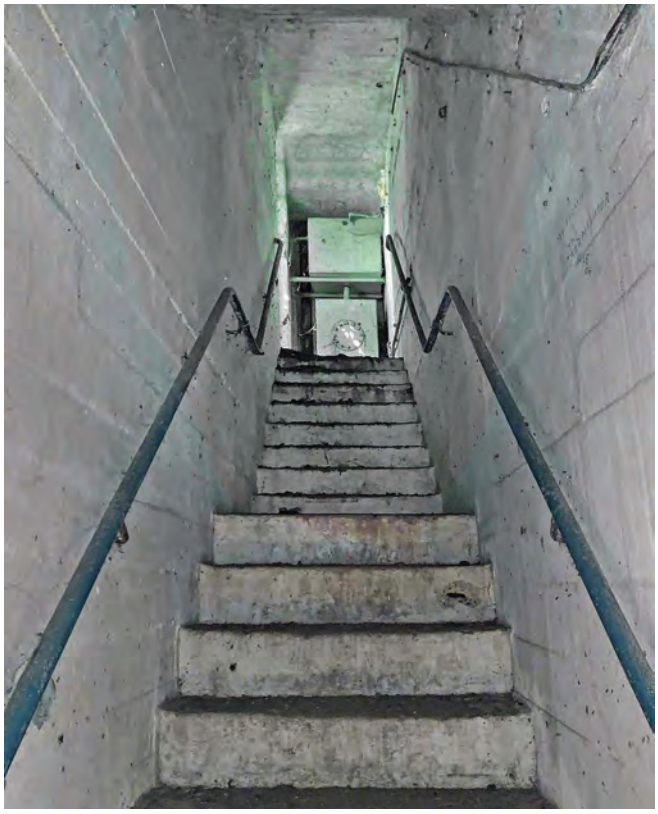
This new door was fitted by Westminster parks department after the sealed bunker was brought to their attention by Sub Brit's Keith Ward

was a proposal to build one in Hyde Park behind the Hyde Park Barracks. Instead they used the basement of the old town hall in Charing Cross Road.

Water tanks just inside the entrance

London Borough of Westminster Control

The new London Borough of Westminster used the former St Marylebone control as the new Westminster Control. It was designated A5 in the North London Group reporting to the Group Headquarters at Partingdale Lane, Mill Hill. Paddington was retained as a sub control but



Looking up the stairs

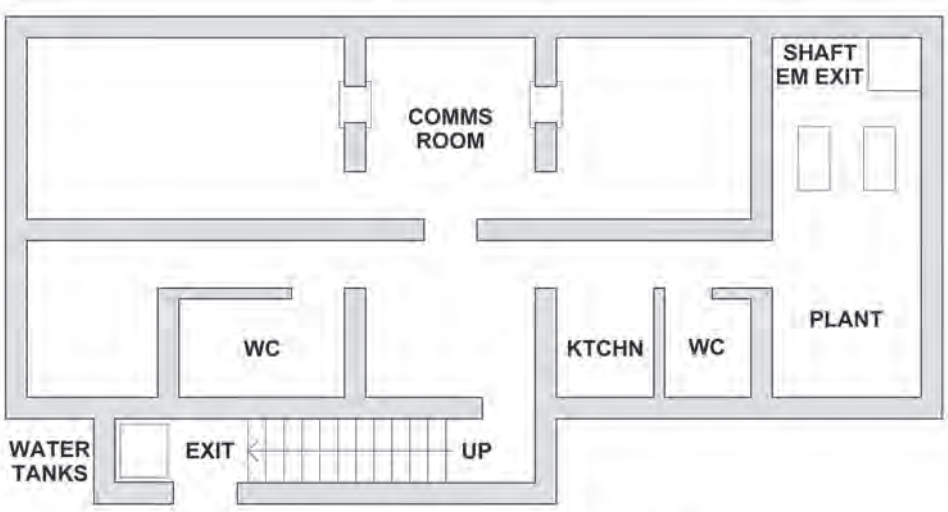
closed in 1965. When visited by members of Sub Brit in January 2002 the entrance door had been removed and the doorway was bricked up. Keith Ward contacted Westminster Council about access and they were initially very helpful. They reopened the bunker and fitted a new steel door but then refused access due to health and safety.

Access at last

Access was finally possible in 2021 when the bunker was found to be in good internal condition but stripped of most fixtures and fittings. The standby generator and some other electrical equipment remained. The kitchen also retained an electric cooker, a butler sink, a water heater and water tank. The WC cubicles still retain flushing toilets. The main water tank is also still in place at the top of the stairs beside the entrance door.

All photos by Keith Ward unless stated

Turning right at the bottom of the stairs the first room on the right is the kitchen



PADDINGTON BOROUGH CONTROL

Drawn by Tim Robinson

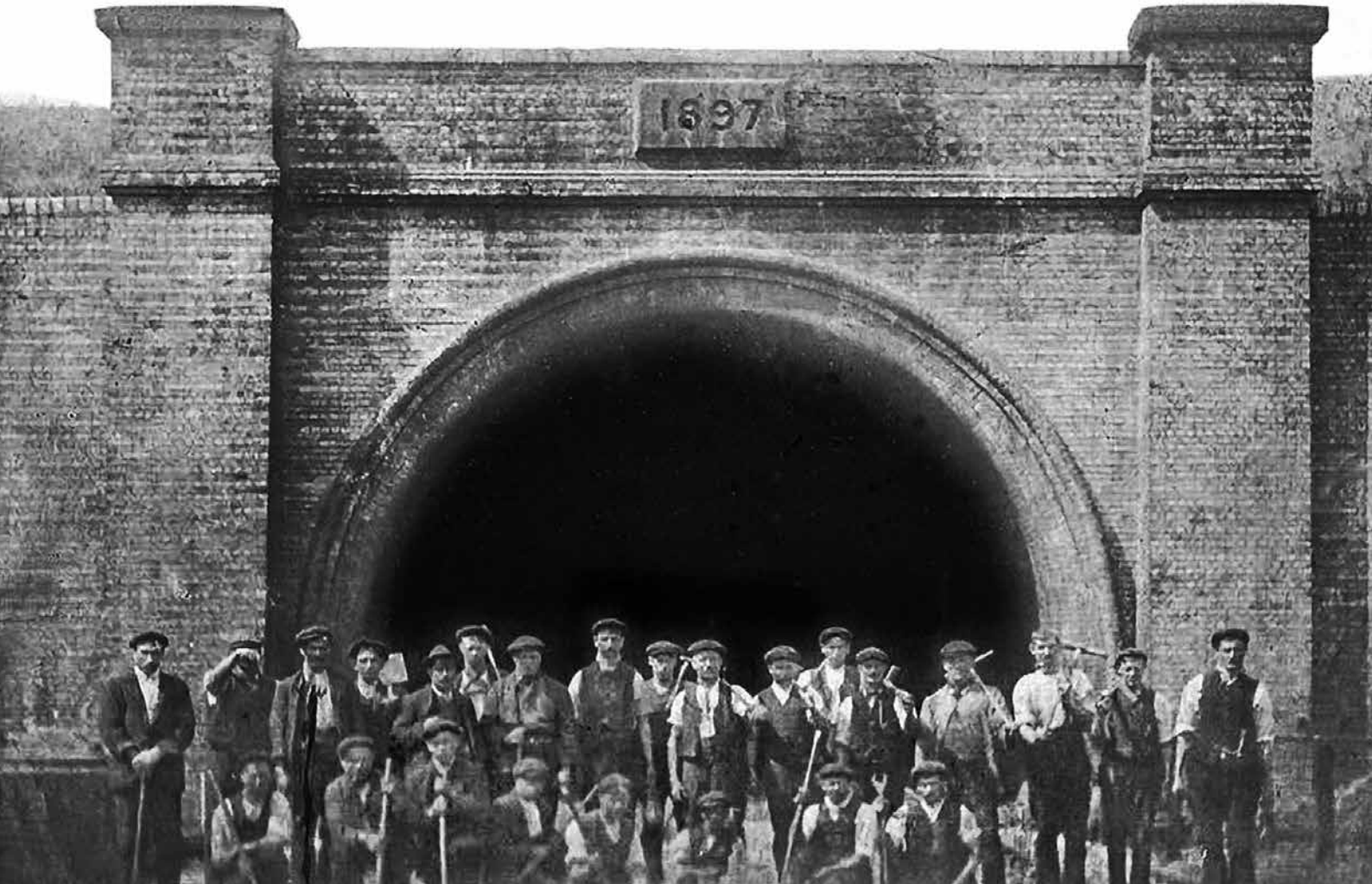
There are two toilets, male and female, each with flushing WC cubicles

The communications room is on the other side of the spine corridor. Evidence of acoustic booths can still be seen along with two message hatches into the two adjacent rooms which was probably the control room

The plant room is at the end of the spine corridor. The standby generator and some electrical fittings are still in place.

Message hatches are a quick and convenient way of passing information between rooms

1897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